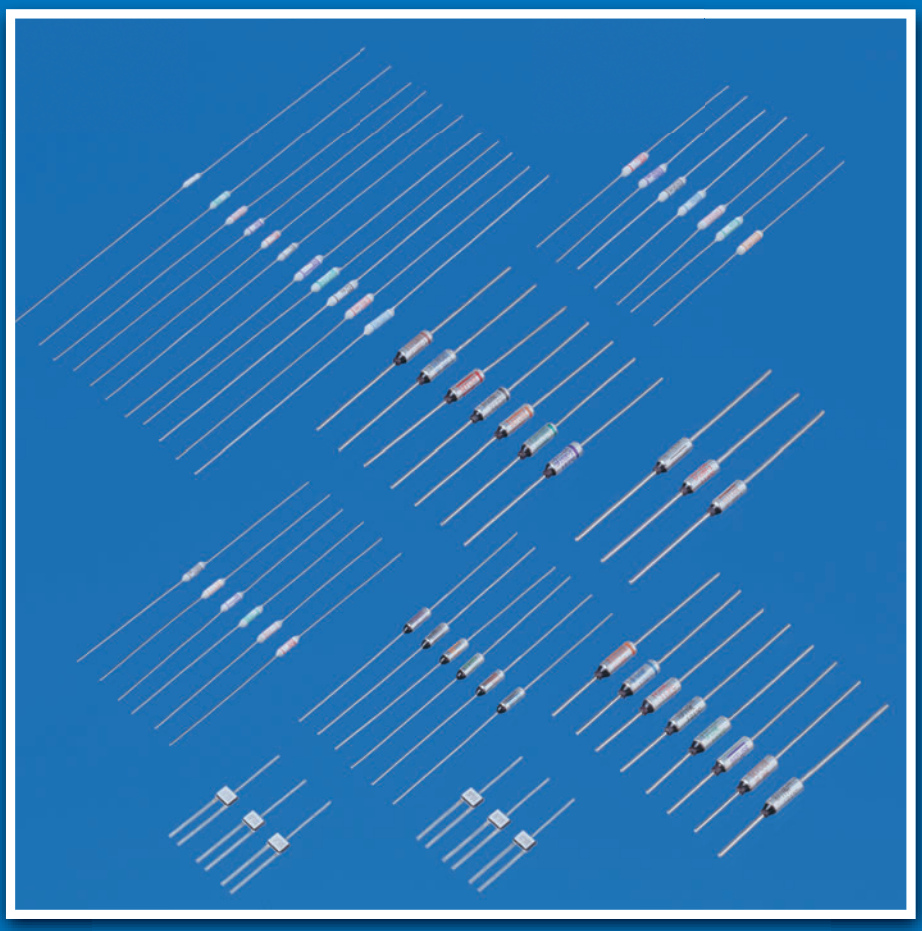
NEC/SCHOTT

SEFUSE®

THERMAL CUTOFF



NEC SCHOTT Components Corporation

SEFUSE®

Contents

Please review the "Cautions" on pages 23 through 26 prior to using SEFUSE®

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		AC	DC		
SF-Type [Thermal pellet]	SF/E	10/15A	—	73℃~240℃	5
	SFH/E	10/15A		110℃~176℃	7
	SF/K	6A		73℃~216℃	9
	SF/Y	15A		73℃~240℃	9
	SF/L	10/15A		73℃~240℃	11
SM-Type [Fusible alloy]	SM/A	2A	3~7A	76℃~151℃	13
	SM/B	1A	3~6A	87℃~151℃	13
	SM/G	0.5A	5A	115℃~151℃	13
D6-Type [Fusible alloy with Heater]	D6X	—	12A	139℃	15
	D6WX	—	15A		15
	D6i		9A		15

Select optimal series according to temperature and electrical ratings.

Safety standards

PSE (Japan) UL (USA) cUL (Canada) CSA (Canada) VDE (Germany) BEAB (UK) CCC (China) KC (Korea)

NEC SCHOTT Components Corporation

NEC SCHOTT Components Corporation is a joint venture company, established in September 2000, between SCHOTT Electronics GmbH of Germany and NEC of Japan. In the electronic components market, the company is a leading supplier of glass-to-metal seals, thermal cutoffs and special glass materials. Moving forward, NEC SCHOTT will continue to optimize the global know-how of the SCHOTT and NEC groups to provide products and services that satisfy our customers' requirements in the 21st century and beyond.

SEFUSE®

Thermal Cutoff

NEC SCHOTT Components Corporation develops and manufactures thermal cutoff protection devices, widely known as SEFUSE®. These devices are designed to protect industrial and home electrical equipment from catching fire by sensing overheating and cutting off the electrical circuit immediately.

There are three SEFUSE® types, namely, SF, SM and D6, to suit the needs of a wide range of applications. The SF-type uses a thermosensitive material as the thermal pellet, while the SM- and D6-types use a fusible alloy.

SEFUSE® meets a number of international industrial safety standards, and is a highly reliable thermal protection device that provides excellent and long-lasting performance.

Features

- The SF-Type, except SF/K series, has a ceramic pipe that alleviates any stress that may occur on the sealing resin when the leads are bent, thereby reliably holding the leads in place. In addition, the sliding contact is made of a silver copper oxide (AgCuO) material that is patented worldwide.
- The SEFUSE® D6-type integrates a heater resistance within the thermal cutoff. Hence, the D6-type thermal protection device can be activated either when the abnormal temperature increase is caused by the external environment, or when it is resulted from the heat generation triggered by the external signal.
- Meets many international safety standards such as UL, VDE, CCC, PSE etc.
- Eco-friendly with no hazardous substances (complies with WEEE and RoHS)

Applications

- Small home appliances, such as coffee makers, electric kettles, rice cookers, bread makers, hot plates, irons and hair dryers
- Large home appliances such as air-conditioners, refrigerators, washing machine, fan heaters, gas boilers
- Office equipment such as copiers, laser beam printers, facsimile and power taps
- Battery devices such as battery packs and chargers
- Various power supplies such as transformers, adaptors, invertors and cement resistance
- Car applications such as automotive air-conditioners, solenoids and motors

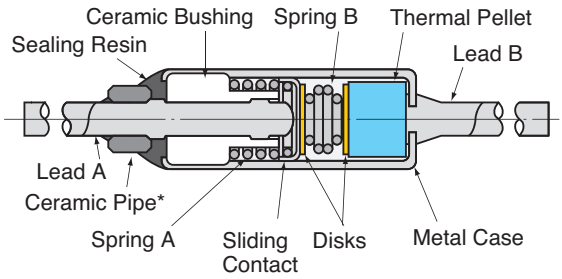
Construction

SF Type

SF/E, SFH/E, SF/K, SF/Y, SF/L Series

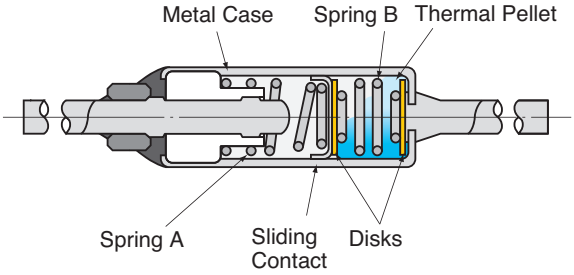
The thermosensitive pellet placed inside the metal case of the SF-type responds to an abnormal temperature situation and triggers the cutoff function. The SF-type features a large rated current of 6A to 15A (AC).

Before operation



The SF-type contains a sliding contact, springs and a thermal pellet inside a metal case. When spring B is compressed, there is firm contact between lead A and the sliding contact. At normal temperatures, current flows from lead A to the sliding contact and then through the metal case to lead B.

After operation



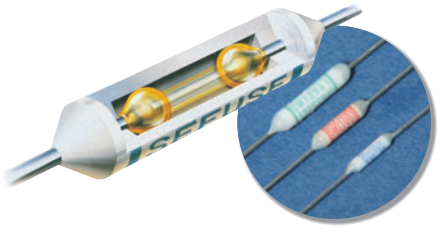
When the ambient temperature rises to the operating temperature of the SF-type, heat is transferred through the metal case and melts the thermal pellet. Springs A and B then stretch and the sliding contact moves away from lead A, thereby opening the electrical circuit.

*Not used in SF/K series.

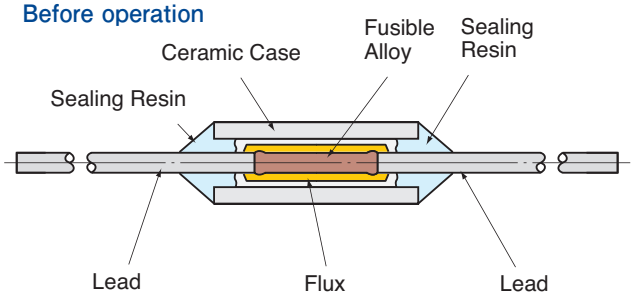
SM Type

SM/A, SM/B, SM/G Series

The SM-type uses a fusible alloy inside a ceramic case. As ceramic is an insulator, the SM-type can be fixed directly where temperature detection is required. The SM-type has a rated current of 0.5A to 2.0A (AC).

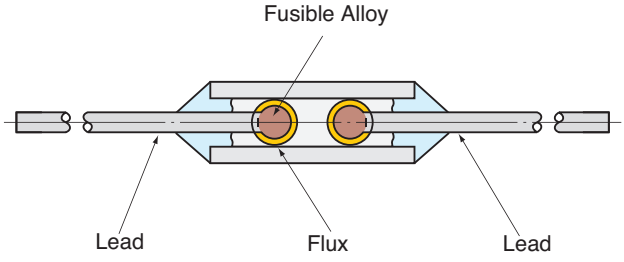


Before operation



The leads of the SM-type are connected by a fusible alloy thereby allowing the current to flow directly from one lead to the other. The fusible alloy is coated with a special flux.

After operation

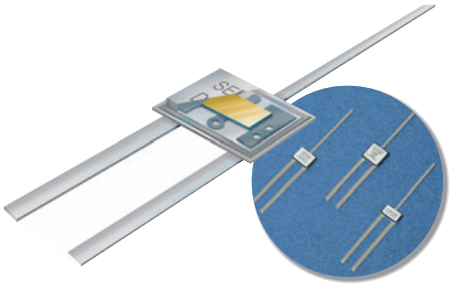


When the ambient temperature rises to the operating temperature of the SM-type, the fusible alloy melts and forms a drop around the end of each lead due to the surface tension and the special flux coating. Without a direct contact between the leads, the electrical circuit is opened.

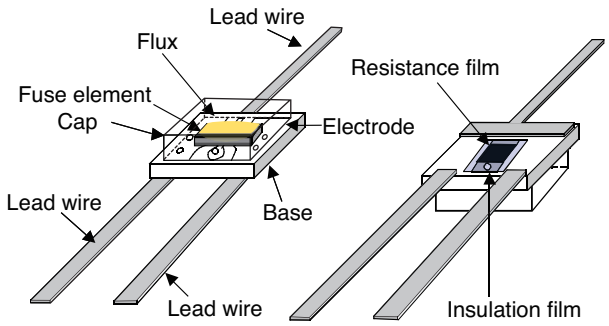
D6
Type

D6X, D6WX, D6i Series

The D6-type uses a ceramic material for the body (cap and base) and integrates a resistor as a heater inside the thermal cutoff.
Hence, the D6-type can be activated either when the abnormal temperature increase is caused by the external environment, or when it is a result of the heat generated by the electrical circuit within the device. This provides a second protection for the electrical equipment in which the D6-type is installed.
The D6-type is available for 9A, 12A and 15A(DC).

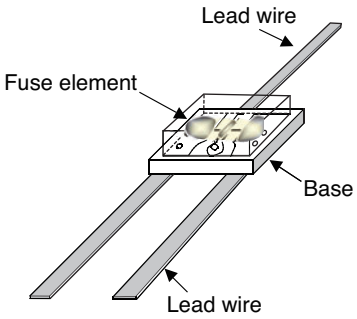


Before operation



The D6-type houses a printed electrode, a fuse element and a special flux material in layers on top of the ceramic base. The current flows from one lead, across the fuse element and then through the second lead.

After operation

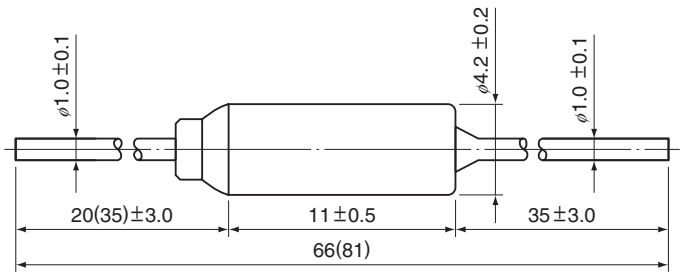


When the ambient temperature rises to the operating temperature of the D6-type, the fuse element melts, and forms a drop around the end of each lead because of surface tension and the special flux coating. This cuts off the electrical circuit. In another scenario, the heater resistance generates heat in response to an external signal, thereby melting the fuse element and cutting off the electrical circuit immediately.

Standard Ratings

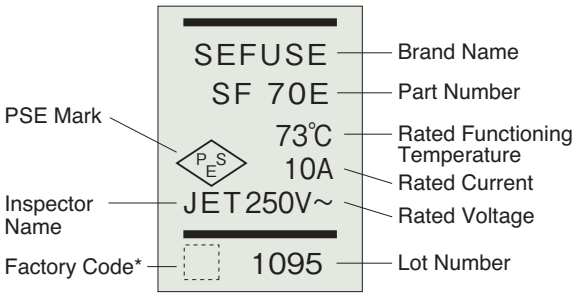
SF/E Series

Dimension (Unit:mm)

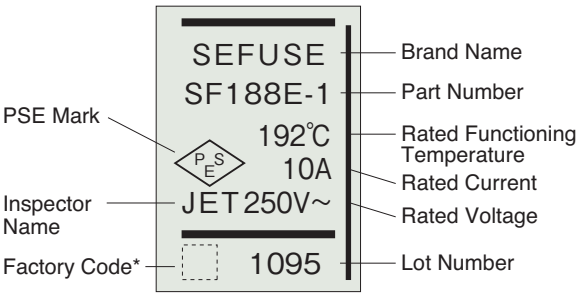


Note: The dimensions for long lead devices are in parentheses.

Marking 1 (SF70E~SF129E)



Marking 2 (SF139E~SF240E)



* Factory Code represents the factory location as shown below

Japan : none
Thailand : C

How to read a lot number

ex.) 10 9 5

- 5 — Sub-lot number
- 9 — Month
  - X·····October
  - Y·····November
  - Z·····December
- 10 — Last two digit of year

Ratings

1) WEEE (RoHS)	2) Part Number	Rated Functioning Temperature Tf (°C)	Operating Temperature (°C)	Holding Temperature Th (°C)	Maximum Temperature Limit Tm (°C)	Rated Current	Rated Voltage	UL JPN	UL Thai	CSA JPN	CSA Thai	VDE JPN	VDE Thai	BEAB JPN	BEAB Thai	6) CCC JPN	6) CCC Thai	KTL JPN (SU05019)-XXXXX	KTL Thai (SU05020)-XXXXX	7) PSE JPN (JET1975-32001-XXXX) Rating 15A	7) PSE JPN (JET1975-32001-XXXX) Rating 10A	7) PSE Thai (JET1974-32001-XXXX) Rating 15A	7) PSE Thai (JET1974-32001-XXXX) Rating 10A
○	SF 70E	73	70 ± 2	58	150	4) 15A/10A (Resistive)	4) AC250V	E71747	5)	172780 (LR52330)		677802-1171 -0002		C1137		※1	※2	5005	5004	2001	1008	2001	1003
○	SF 76E	77	76 ± 4 0	62																			
○	SF 91E	94	91 ± 1 3	79																2002	1010	2002	1002
○	SF 96E	99	96 ± 2	84																			
○	SF113E	113	110 ± 2	98	160													5006	5005	2003	1011	2003	1001
○	SF119E	121	119 ± 2	106	150													5007	5006	2004	1012	2004	1004
○	SF129E	133	129 ± 2	118	159																		
○	SF139E	142	139 ± 2	127																2005	1013	2005	1005
○	SF152E	157	152 ± 2	142	172																		
○	SF169E	172	169 ± 1 3	157	189													5008	5007	2006	1014	2006	1006
○	SF184E	184	182 ± 2	174	210															2007	1015	2007	1007
○	SF188E	192	188 ± 1 3	177	375																		
○	SF214E	216	214 ± 1 3	200														5009	5008	2008	1016	2008	1008
○	SF226E	227	226 ± 1 3		3)															2009	1017	2009	1009
○	SF240E	240	237 ± 2		375																		

Note 1) No use of hazardous substances prescribed by WEEE and RoHS.
With the exception of SF91E, all products do not use SVHC prescribed by REACH (46 substances,15 Dec 2010).
(SF91E uses SVHC as the thermosensitive pellet.)

1: 2002010205023072 (10A)
2004010205121099 (15A)
2: 2002010205023074 (10A)
2004010205120822 (15A)

2) Part number indicates thermal cutoffs with standard lead lengths. For long lead length types, add the suffix "-1" at the end of the part number.

3) The maximum temperature limit Tm of SF226E is shown in the following table:

Tm	UL	CSA	VDE	BEAB	CCC	KTL
SF226E	240°C	330°C	300°C			

4) The electrical ratings according to the various safety standards are shown in the following table.

Rated Voltage	UL	CSA	VDE	BEAB	CCC	KTL	PSE 7)
AC120V	15A (Inductive) (Resistive) 20A (Resistive)						
AC240V	15A (Resistive)						
AC250V	10A (Resistive)	15A (Inductive)	10A	10A	10A	10A	10A
	15A (Resistive)	15A (Resistive)	15A	15A	15A	15A	15A
	17A (Resistive)						
AC277V	15A (Resistive)						

5) The following SF-types have passed the Conductive Heat Aging Test (CH) specified by the UL safety standard: SF169E, SF184E, SF188E, SF214E, SF226E and SF240E.

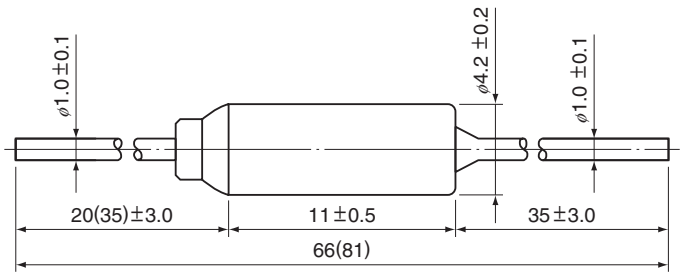
6) SF/E is available for rating 10A and 15A marking for CCC standard. Please select suitable rating product according to the specification of end-application.

7) SF/E is available for rating 10A and 15A marking for PSE standard. Rating 10A marking is applied for Article 1, and Rating 15A marking is applied for Article 2 of the technical requirement of the METI ordinance J60691. Please select suitable rating product according to the specification of end-application.

Standard Ratings

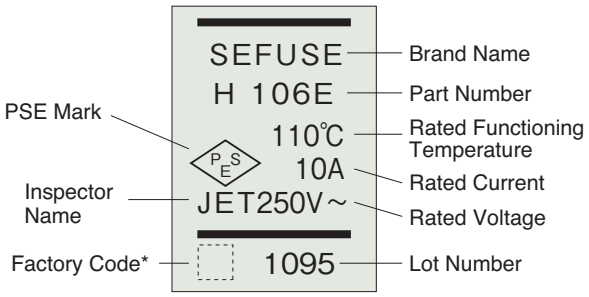
SFH/E Series

Dimension (Unit:mm)

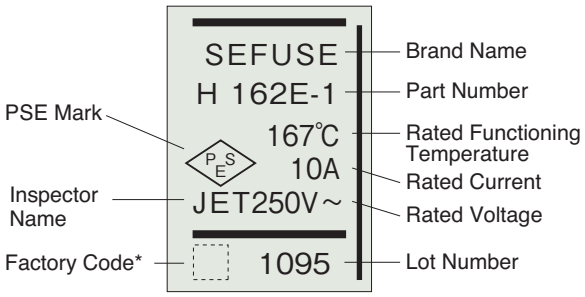


Note: The dimensions for long lead devices are in parentheses.

Marking 1 (SFH106E~SFH129E)



Marking 2 (SFH134E~SFH172E)



* Factory Code represents the factory location as shown below

Japan : none
Thailand : C

How to read a lot number

ex.) 10 9 5
- 5: Sub-lot number
- 9: Month (X·····October, Y·····November, Z·····December)
- 10: Last two digit of year

Ratings

1) WEEE (RoHS)	2) Part Number	Rated Functioning Temperature Tf (°C)	Operating Temperature (°C)	Holding Temperature Th (°C)	Maximum Temperature Limit Tm (°C)	Rated Current	Rated Voltage	UL·c-UL		VDE		BEAB		5) CCC		KTL		6) PSE			
								JPN	Thai	JPN	Thai	JPN	Thai	JPN	Thai	JPN (SU05019-XXXXX)	Thai (SU05020-XXXXX)	JPN (JET1975-32001-XXXX)		Thai (JET1974-32001-XXXX)	
																		Rating 15A	Rating 10A	Rating 15A	Rating 10A
○	SFH106E	110	106 ± 3/2	99	380	3) 15A/10A (Resistive)	3) AC250V	E71747 4)		677802 -1171 -0009		C1185		※1	※2	5006	5005	2003	1011	2003	1001
○	SFH109E	113	109 ± 3/2	102																	
○	SFH113E	117	113 ± 3/2	106																	
○	SFH117E	121	117 ± 3/2	110												5007	5006	2004	1012	2004	1004
○	SFH124E	128	124 ± 3/2	117																	
○	SFH129E	134	129 ± 3/2	122																	
○	SFH134E	139	134 ± 3/2	127																	
○	SFH152E	157	152 ± 3/2	145														2005	1013	2005	1005
○	SFH162E	167	162 ± 3/2	155												5008	5007	2006	1014	2006	1006
○	SFH172E	176	172 ± 3	165																	

※1: 2006010205173643(10A)
2006010205173642(15A)
※2: 2006010205173644(10A)
2006010205173645(15A)

Note 1) No use of hazardous substances prescribed by WEEE and RoHS.
All products do not use SVHC prescribed by REACH (46 substances, 15 Dec 2010).

2) Part number indicates thermal cutoffs with standard lead lengths. For long lead length types, add the suffix "-1" at the end of the part number.

3) The electrical ratings according to the various safety standards are shown in the following table.

Rated Voltage	UL	VDE	BEAB	CCC 5)	KTL	PSE 6)
AC120V	20A (Resistive)					
AC250V	10A (Resistive)	10A	10A	10A	10A	10A
	15A (Resistive)	15A	15A	15A	15A	15A
	17A (Resistive)					

4) The following SF-types have passed the Conductive Heat Aging Test (CH) specified by the UL safety standard: SFH172E.

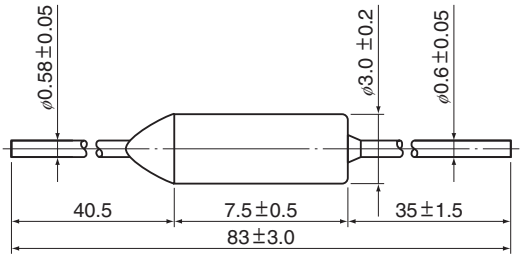
5) SFH/E is available for rating 10A and 15A marking for CCC standard. Please select suitable rating product according to the specification of end-application.

6) SFH/E is available for rating 10A and 15A marking for PSE standard. Rating 10A marking is applied for Article 1, and Rating 15A marking is applied for Article 2 of the technical requirement of the METI ordinance J60691. Please select suitable rating product according to the specification of end-application.

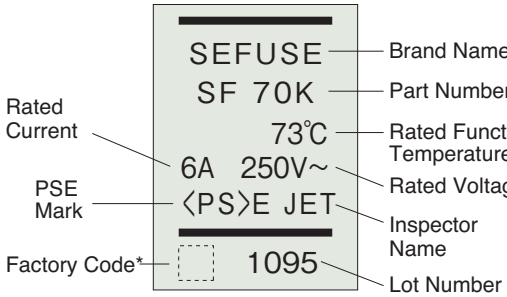
Standard Ratings

SF/K Series

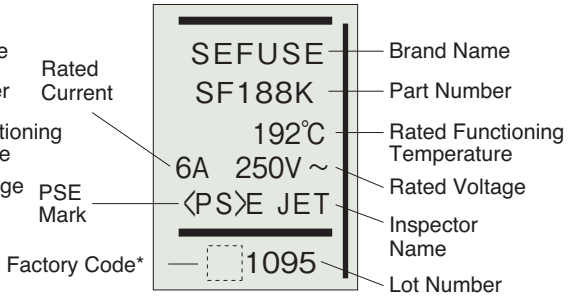
Dimension (Unit:mm)



Marking 1 (SF70K~SF119K)



Marking 2 (SF118K,SF214K)



How to read a lot number

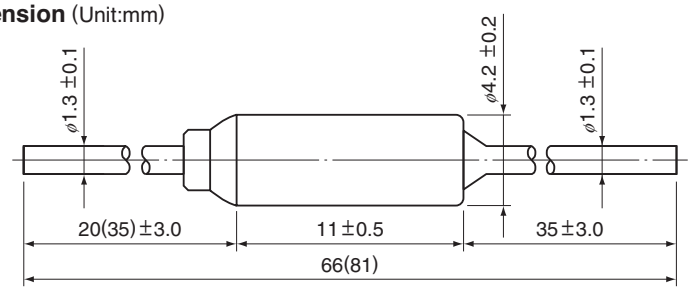
ex.) 10 9 5
- 5 — Sub-lot number
- 9 — Month: X·····October, Y·····November, Z·····December
- 10 — Last two digit of year

* Factory Code represents the factory location as shown below

Japan : none
Thailand : C

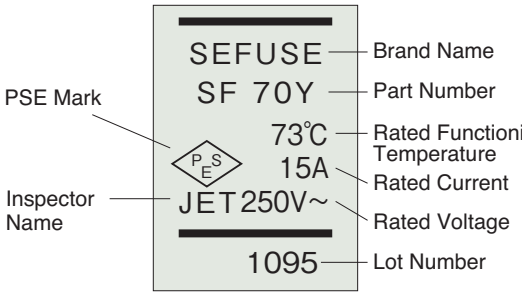
SF/Y Series

Dimension (Unit:mm)

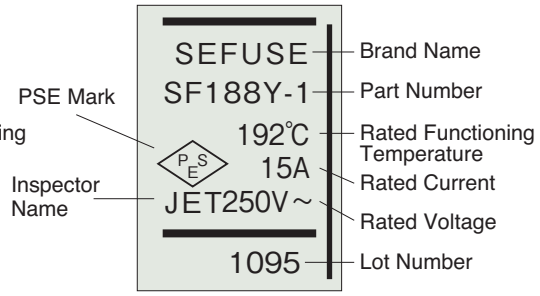


Note: The dimensions for long lead devices are in parentheses.

Marking 1 (SF70Y~SF129Y)



Marking 2 (SF139Y~SF240Y)



How to read a lot number

ex.) 10 9 5
- 5 — Sub-lot number
- 9 — Month: X·····October, Y·····November, Z·····December
- 10 — Last two digit of year

Ratings

1) WEEE (RoHS)	Part Number	Rated Functioning Temperature Tf (°C)	Operating Temperature (°C)	Holding Temperature Th (°C)	Maximum Temperature Limit Tm (°C)	Rated Current	Rated Voltage	UL• c-UL	VDE	BEAB	CCC	KTL	PSE
								Thailand	Thailand	Thailand	Thailand	Thailand (SU05020 -XXXXX)	Thailand (JET1974-32001-XXXX)
○	SF 70K	73	70 ± 2	45	150	2) 6A (Resistive)	AC250V	E71747	677802 -1171 -0006	C1180	※1)	5004	1003
○	SF 76K	77	76 $\pm^{0}_{4}$	51									
○	SF 91K	94	91 $\pm^{3}_{1}$	66									1002
○	SF 96K	99	96 ± 2	71									
○	SF119K	121	119 ± 2	94								5006	1004
○	SF188K	192	188 $\pm^{3}_{1}$	164	300			3)				5007	1007
○	SF214K	216	214 $\pm^{1}_{3}$	198								5008	1008

1: 2008010205282881

Note 1) No use of hazardous substances prescribed by WEEE and RoHS.
With the exception of SF91K, all products do not use SVHC prescribed by REACH (46 substances, 15 Dec 2010).
(SF91K uses SVHC as the thermosensitive pellet.)

2) The following electrical ratings were used for the UL, VDE and KTL safety standards: 10A (Resistive) / AC 250V.

3) The following SF-types have passed the Conductive Heat Aging Test (CH) specified by the UL safety standard: SF188K and SF214K.

Ratings

1) WEEE (RoHS)	2) Part Number	Rated Functioning Temperature Tf (°C)	Operating Temperature (°C)	Rated Current	Rated Voltage	U L	CCC	PSE
						Japan	Japan	Japan (JET1975-32001-XXXX)
○	SF 70Y	73	70 ± 2	15A	AC250V		※1	1008
○	SF 76Y	77	76 $\pm^{0}_{4}$					
○	SF 91Y	94	91 $\pm^{3}_{1}$					1010
○	SF 96Y	99	96 ± 2					
○	SF113Y	113	110 ± 2					1011
○	SF119Y	121	119 ± 2			E71747		1012
○	SF129Y	133	129 ± 2					
○	SF139Y	142	139 ± 2					1013
○	SF152Y	157	152 ± 2			E71747		
○	SF169Y	172	169 $\pm^{1}_{3}$					1014
○	SF184Y	184	182 ± 2					1015
○	SF188Y	192	188 $\pm^{3}_{1}$					
○	SF214Y	216	214 $\pm^{1}_{3}$					1016
○	SF226Y	227	226 $\pm^{1}_{3}$					1017
○	SF240Y	240	237 ± 2					

1: 2004010205122568

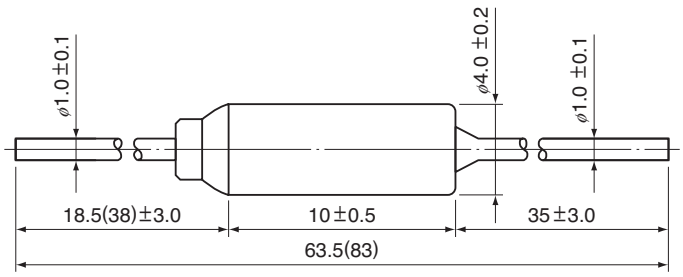
Note 1) No use of hazardous substances prescribed by WEEE and RoHS.
With the exception of SF91Y, all products do not use SVHC prescribed by REACH (46 substances, 15 Dec 2010).
(SF91Y uses SVHC as the thermosensitive pellet.)

2) Part number indicates thermal cutoffs with standard lead lengths. For long lead length types, add the suffix “-1” at the end of the part number.

Standard Ratings

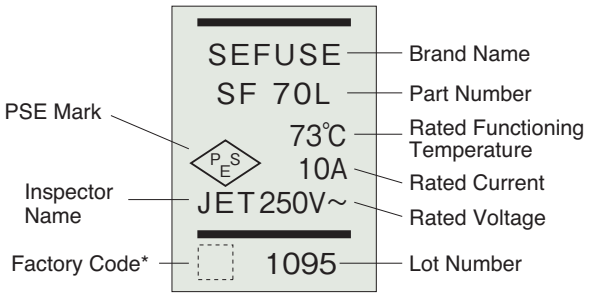
SF/L Series

Dimension (Unit:mm)

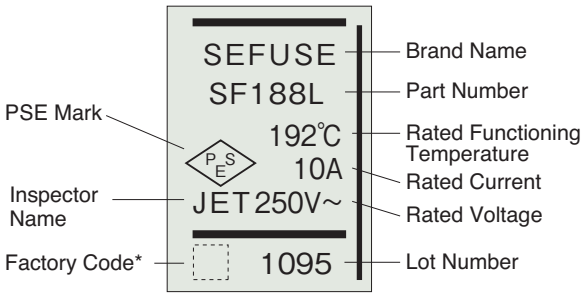


Note: The dimensions for long lead devices are in parentheses.

Marking 1 (SF70L~SF129L)



Marking 2 (SF139L~SF240L)



* Factory Code represents the factory location as shown below

Japan : none
Thailand : C

How to read a lot number

ex.) 10 9 5
- 5: Sub-lot number
- 9: Month
  - X·····October
  - Y·····November
  - Z·····December
- 10: Last two digit of year

Ratings

1) WEEE (RoHS)	2) Part Number	Rated Functioning Temperature Tf (°C)	Operating Temperature (°C)	Holding Temperature Th (°C)	Maximum Temperature Limit Tm (°C)	Rated Current	Rated Voltage	UL・c-UL Thailand		VDE Thailand	CCC 5) Thailand	KTL Thailand (SU05020-XXXXX)	PSE 6) Thailand (JET1974-32001-XXXX) Rating15A	PSE 6) Thailand (JET1974-32001-XXXX) Rating10A
○	SF 70L	73	70 ± 2	58	150	3) 15A／10A (Resistive)	3) AC250V	E71747	4)	677802-1171 -0013	※2	5004	2001	1003
○	SF 76L	77	76 $\pm^{0}_{4}$	62										
○	SF 90L	94	90 ± 2	79									2002	1002
○	SF 96L	99	96 ± 2	84										
○	SF113L	113	110 $\pm^{0}_{4}$	98	160							5005	2003	1001
○	SF119L	121	119 ± 2	106	150							5006	2004	1004
○	SF129L	133	129 ± 2	118	159									
○	SF139L	142	139 ± 2	127									2005	1005
○	SF152L	157	152 ± 2	142	172									
○	SF167L	167	164 ± 2	153	245							5007	2006	1006
○	SF169L	172	169 $\pm^{1}_{3}$	157	240									
○	SF184L	184	182 ± 2	174	210				4)				2007	1007
○	SF188L	192	188 $\pm^{3}_{1}$	177	375									
○	SF214L	216	214 $\pm^{1}_{3}$	200				※1				5008	2008	1008
○	SF229L	229	227 ± 2		380				4)				2009	1009
○	SF240L	240	237 ± 2		375									

※1 : under application

Note 1) No use of hazardous substances prescribed by WEEE and RoHS.
All products do not use SVHC prescribed by REACH (46 substances, 15 Dec 2010).

2: 2008010205279248 (10A)
2008010205279249 (15A)

2) Part number indicates thermal cutoffs with standard lead lengths. For long lead length types, add the suffix “-1” at the end of the part number.

3) The electrical ratings according to the various safety standards are shown in the following table.

Rated Voltage	UL	VDE	CCC 5)	KTL	PSE 6)
AC120V	16A (Resistive) 20A (Resistive)				
AC250V	10A (Resistive)	10A	10A	10A	10A
	15A (Resistive)	15A	15A	15A	15A
	16A (Resistive)				

4) The following SF-types have passed the Conductive Heat Aging Test (CH) specified by the UL safety standard: SF184L, SF188L, SF229L and SF240L.

5) SF/L is available for rating 10A and 15A marking for CCC standard. Please select suitable rating product according to the specification of end-application.

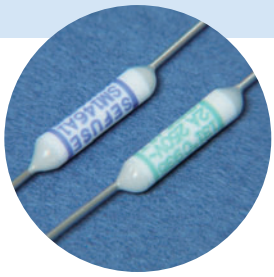
6) SF/L is available for rating 10A and 15A marking for PSE standard. Rating 10A marking is applied for Article 1, and Rating 15A marking is applied for Article 2 of the technical requirement of the METI ordinance J60691. Please select suitable rating product according to the specification of end-application.

SM type

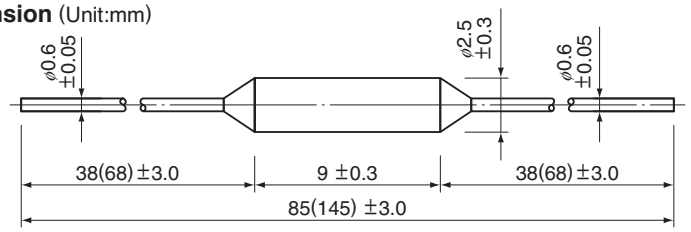
SEFUSE®

Standard Ratings

SM/A Series

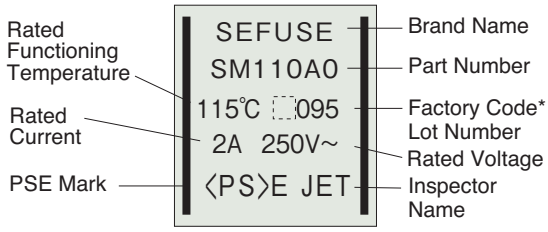


Dimension (Unit:mm)



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

Marking



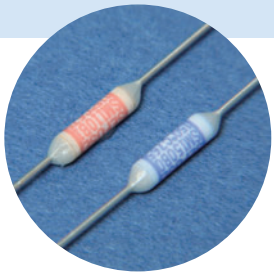
* Factory Code represents the factory location as shown below

Japan : none
Thailand : C

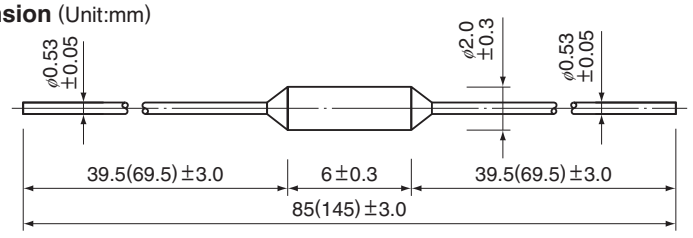
How to read a lot number

ex.) 0 9 5
- 5: Sub-lot number
- 9: Month (X·····October, Y·····November, Z·····December)
- 0: Last one digit of year

SM/B Series

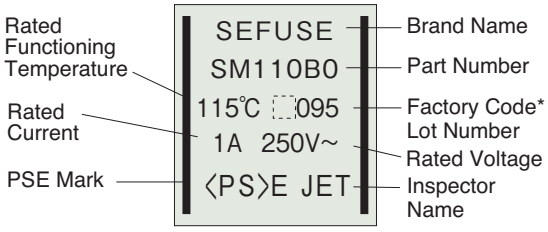


Dimension (Unit:mm)



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

Marking



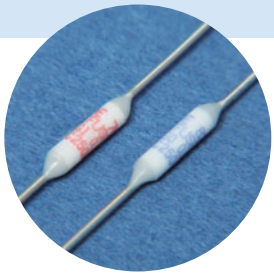
* Factory Code represents the factory location as shown below

Japan : none
Thailand : C

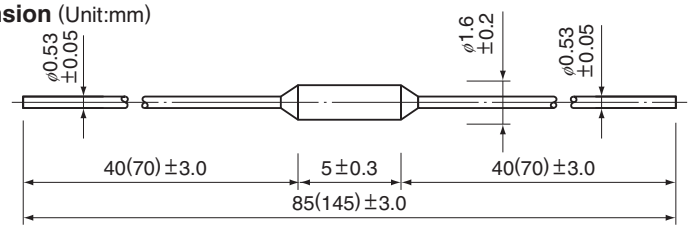
How to read a lot number

ex.) 0 9 5
- 5: Sub-lot number
- 9: Month (X·····October, Y·····November, Z·····December)
- 0: Last one digit of year

SM/G Series

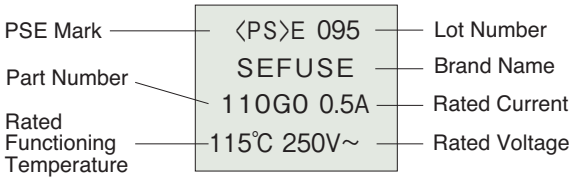


Dimension (Unit:mm)



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

Marking



How to read a lot number

ex.) 0 9 5
- 5: Sub-lot number
- 9: Month (X·····October, Y·····November, Z·····December)
- 0: Last one digit of year

Ratings

1) WEEE (RoHS)	2) Part Number	Rated Functioning Temperature Tf (°C)	Operating Temperature (°C)	Holding Temperature Th (°C)	Maximum Temperature Limit Tm (°C)	Electrical Ratings AC	Electrical Ratings 3) DC	UL JPN	UL Thai	CSA JPN	CSA Thai	VDE JPN	VDE Thai	BEAB JPN	BEAB Thai	CCC JPN	CCC Thai	KTL JPN (SU05019-XXXX)	KTL Thai (SU05020-XXXX)	PSE JPN (JET1975-32001-XXXX)	PSE Thai (JET1974-32001-XXXX)
○	SM072A0	76	72 ± 3/2	46	100	2 A (Resistive) AC250V	3A/DC50V(UL) 4A/DC50V(VDE)	E71747		4)		677802-1171-0001		C1191		※1	※2	5001	5009	1007	1017
○	SM092A0	97	92 ± 3/2	62	200		4ADC50V			172780 (LR52330)										1004	1016
○	SM110A0	115	110 ± 2	80	125		7 A DC50V											5002	5001	1006	1011
○	SM125A0	131	126 ± 3/2	96	200													5003	5002	1002	1012
○	SM137A0	142	137 ± 3/2	107																1003	1013
○	SM146A0	151	146 ± 3/2	116																	
○	SM150A0	150																			

※1: 2002010205002641
※2: 2002010205023067

Note 1) No use of hazardous substances prescribed by WEEE and RoHS.
All products do not use SVHC prescribed by REACH (46 substances, 15 Dec 2010).
2) Part number indicates thermal cutoffs with standard lead lengths. For long lead length types, add the suffix "-1" at the end of the part number.
3) DC ratings are approved by UL and VDE.
4) SM072A0 has c-UL recognition.

Ratings

1) WEEE (RoHS)	2) Part Number	Rated Functioning Temperature Tf (°C)	Operating Temperature (°C)	Holding Temperature Th (°C)	Maximum Temperature Limit Tm (°C)	Electrical Ratings AC	Electrical Ratings 3) DC	UL JPN	UL Thai	CSA JPN	CSA Thai	VDE JPN	VDE Thai	BEAB JPN	BEAB Thai	CCC JPN	CCC Thai	KTL JPN (SU05019-XXXX)	KTL Thai (SU05020-XXXX)	PSE JPN (JET1975-32001-XXXX)	PSE Thai (JET1974-32001-XXXX)
○	SM092B0	97	92 ± 3/2	62	200	1 A (Resistive) AC250V	3 A DC50V	E71747		172780 (LR52330)		677802-1171-0004		C1169		※1	※2	5001	5009	1004	1016
○	SM110B0	115	110 ± 2	80	125		6 A DC50V											5002	5001	1001	1011
○	SM125B0	131	126 ± 3/2	96	200													5003	5002	1002	1012
○	SM137B0	142	137 ± 3/2	107																1003	1013
○	SM146B0	151	146 ± 3/2	116																	
○	SM150B0	150																			

※1: 2002010205002645
※2: 2002010205023066

Note 1) No use of hazardous substances prescribed by WEEE and RoHS.
All products do not use SVHC prescribed by REACH (46 substances, 15 Dec 2010).
2) Part number indicates thermal cutoffs with standard lead lengths. For long lead length types, add the suffix "-1" at the end of the part number.
3) DC ratings are approved by UL and VDE.

Ratings

1) WEEE (RoHS)	2) Part Number	Rated Functioning Temperature Tf (°C)	Operating Temperature (°C)	Holding Temperature Th (°C)	Maximum Temperature Limit Tm (°C)	Electrical Ratings AC	Electrical Ratings 3) DC	UL JPN	CSA JPN	VDE JPN	BEAB JPN	CCC JPN	KTL JPN (SU05019-XXXX)	PSE JPN (JET1975-32001-XXXX)
○	SM110G0	115	110 ± 2	80	125	0.5 A (Resistive) AC250V	5 A DC50V	E71747	172780 (LR52330)	677802-1171-0003	C1157	※1	5002	1006
○	SM137G0	142	137 ± 3/2	107	200								5003	1003
○	SM146G0	151	146 ± 3/2	116										

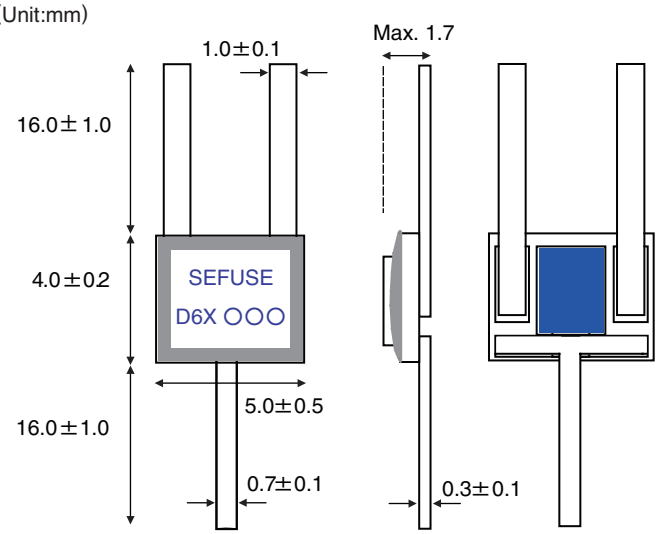
※1: 2002010205023071

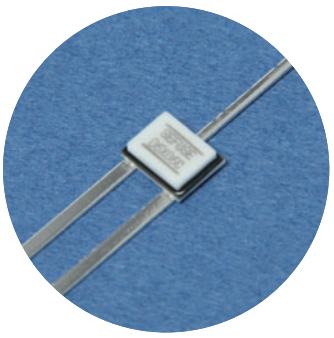
Note 1) No use of hazardous substances prescribed by WEEE and RoHS.
All products do not use SVHC prescribed by REACH (46 substances, 15 Dec 2010).
2) Part number indicates thermal cutoffs with standard lead lengths. For long lead length types, add the suffix "-1" at the end of the part number.
3) DC ratings are approved by UL and VDE.

Standard Ratings

D6X Series

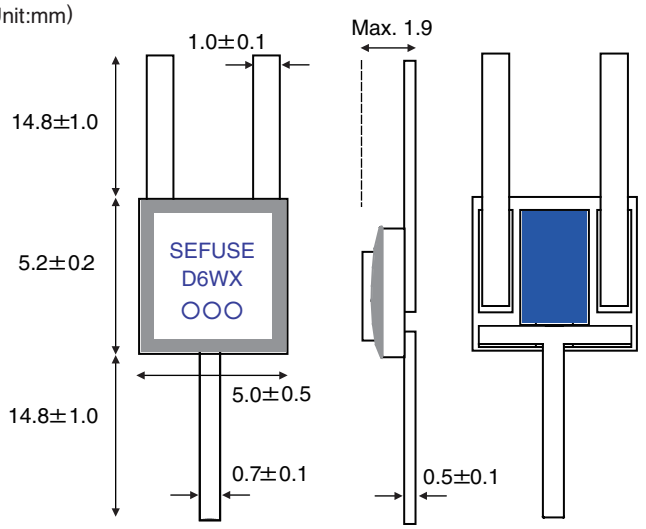
Dimension (Unit:mm)

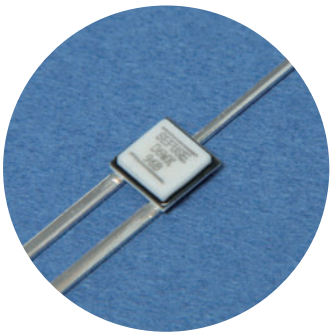




D6WX Series

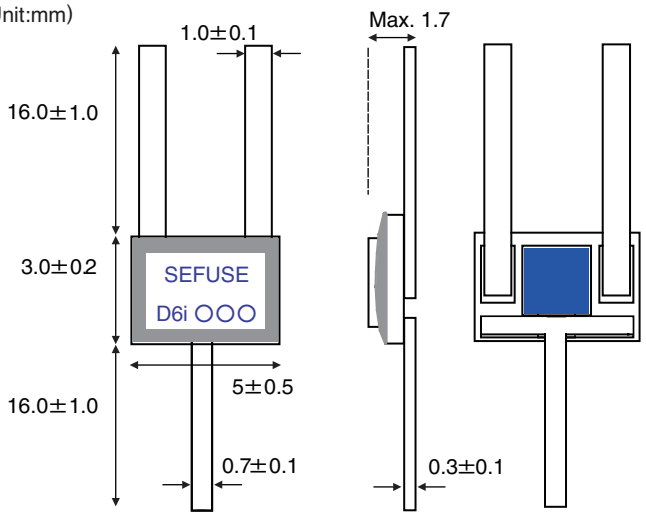
Dimension (Unit:mm)

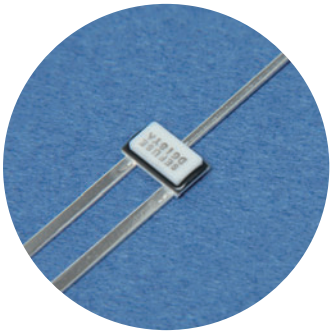




D6i Series

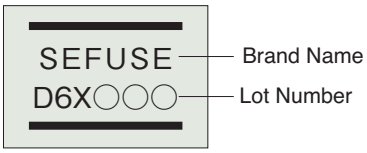
Dimension (Unit:mm)





Marking

D6X Series

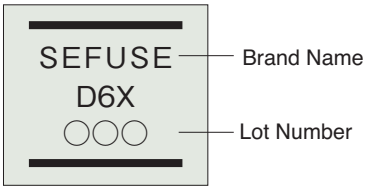


How to read a lot number

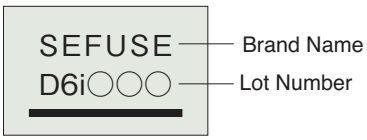
ex.) **0** **9** **A**

- **A**: Sub-lot number
- **9**: Month
  - X……October
  - Y……November
  - Z……December
- **0**: Last one digit of year

D6WX Series



D6i Series



Ratings

1) Meet for WEEE (RoHS)	Part Number	Rated Functioning Temperature Tf (°C)	Operating Temperature (°C)	Holding Temperature Th (°C)	Maximum Temperature Limit Tm (°C)	Rated Current / Voltage (DC)	Heater Resistance (Ω)	UL/cUL Made in Thailand	VDE Made in Thailand	CCC Made in Thailand
○	D6X	139	136 ±3	90	180	12A／32V	50.0 ± 20%	E71747	677802 -1171 -0008	※1
○	D6X-215						21.5 ± 20%			
○	D6X-050						5.0 ± 20%			
○	D6WX					15A／32V	50.0 ± 20%			※2
○	D6WX-215						21.5 ± 20%			
○	D6WX-050						5.0 ± 20%			
○	D6i					9A／32V	50.0 ± 20%			※3
○	D6i-215						21.5 ± 20%			
○	D6i-050						5.0 ± 20%			

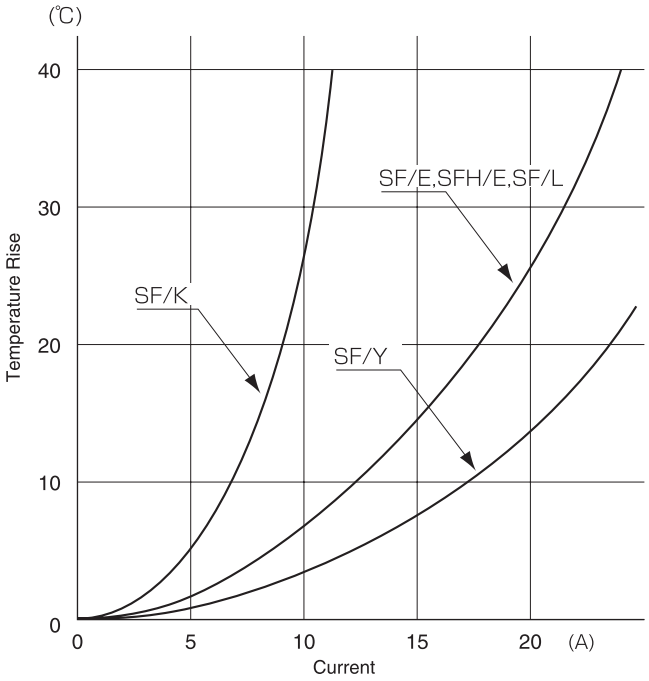
Note 1) No use of hazardous substances prescribed by WEEE and RoHS.
All products do not use SVHC prescribed by REACH (46 substances, 15 Dec 2010).

1: 2010010205394198
2: 2010010205394201
3: 2010010205394200

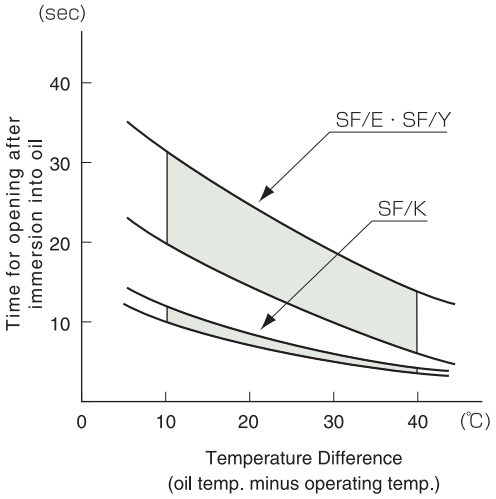
Performance Data

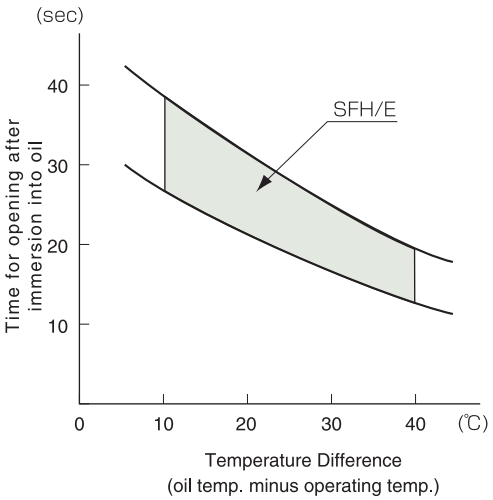
SF/E Series · SFH/E Series · SF/K Series · SF/Y Series · SF/L Series

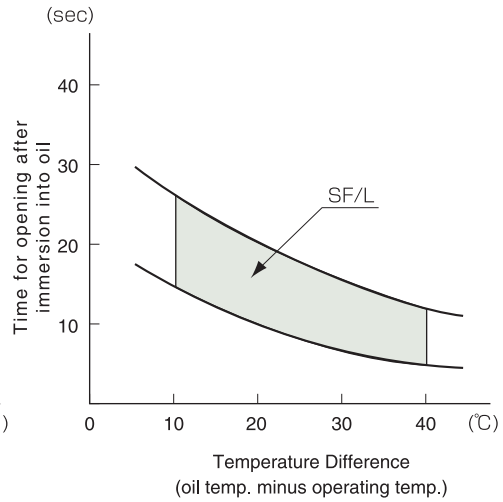
Temperature Rise



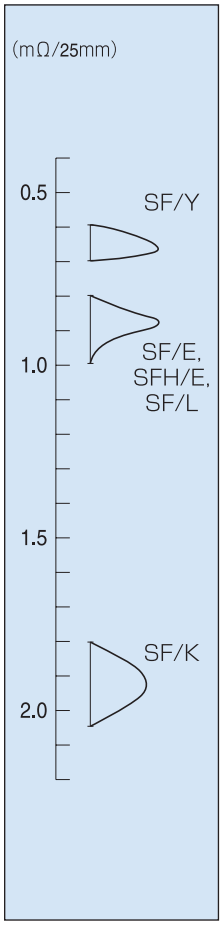
Response Time







Internal resistance



Initial operating temperature (SF/E Series・SF/K Series・SF/Y Series・SF/L Series)

Part Number	Operating Temperature (°C)	Part Number	Operating Temperature (°C)	Part Number	Operating Temperature (°C)
SF70E/K/Y/L	69 70 71	SF119E/K/L/Y	118 119 120	SF184E/Y/L	181 182 183
SF76E/K/Y/L	73 74 75	SF129E/Y/L	129 130 131	SF188E/Y/K/L	189 190 191
SF90L	89 90 91	SF139E/Y/L	138 139 140	SF214E/Y/K/L	212 213 214
SF91E/K/Y	91 92 93	SF152E/Y/L	152 153 154	SF226E/Y	224 225 226
SF96E/K/Y/L	95 96 97	SF167L	163 164 165	SF229L	227 228 229
SF113E/Y/L	108 109 110	SF169E/Y/L	167 168 169	SF240E/Y/L	235 236 237

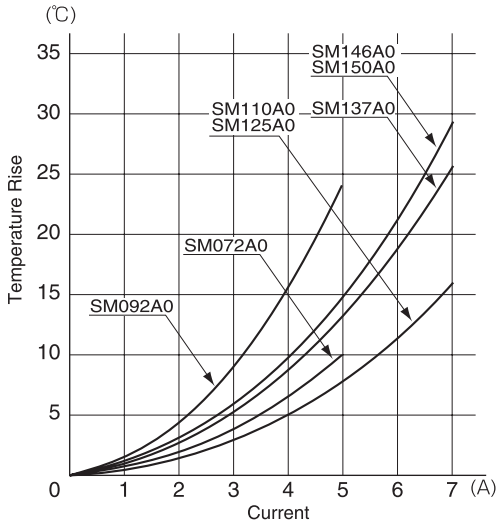
Operating temperature (SFH/E Series)

Part Number	Operating Temperature (°C)	Part Number	Operating Temperature (°C)	Part Number	Operating Temperature (°C)
SFH106E	105 106 107	SFH124E	123 124 125	SFH162E	161 162 163
SFH109E	108 109 110	SFH129E	128 129 130	SFH172E	171 172 173
SFH113E	112 113 114	SFH134E	133 134 135		
SFH117E	116 117 118	SFH152E	151 152 153		

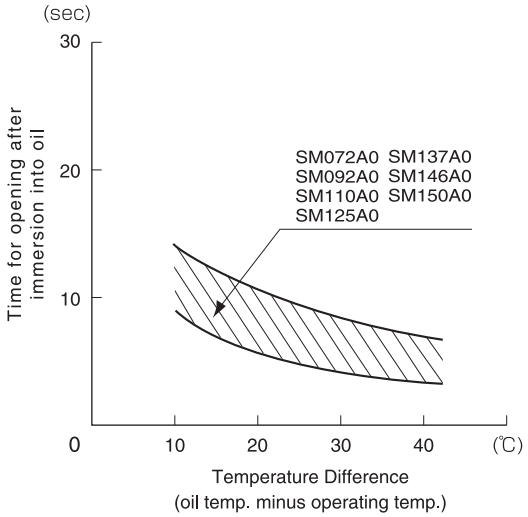
Performance Data

SM/A Series

Temperature Rise

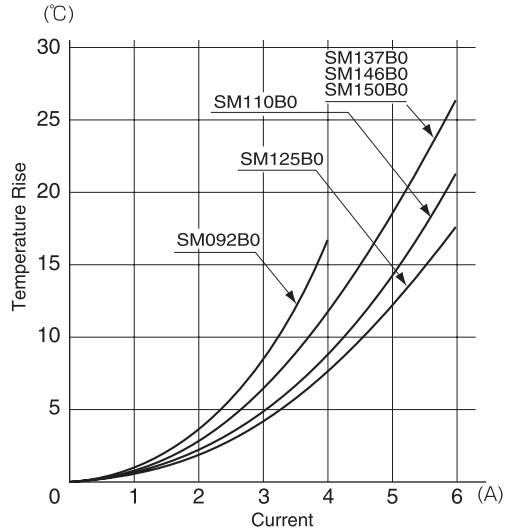


Response Time

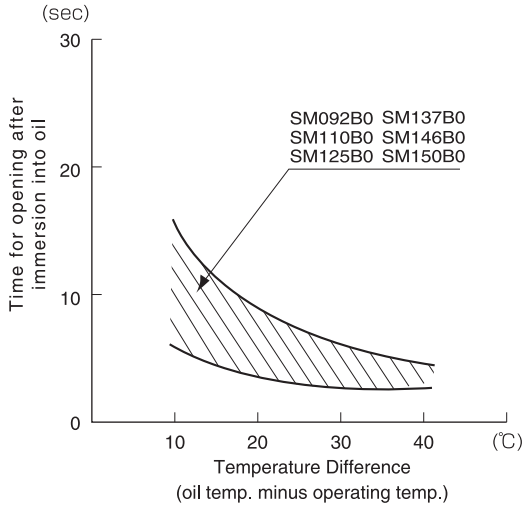


SM/B Series

Temperature Rise

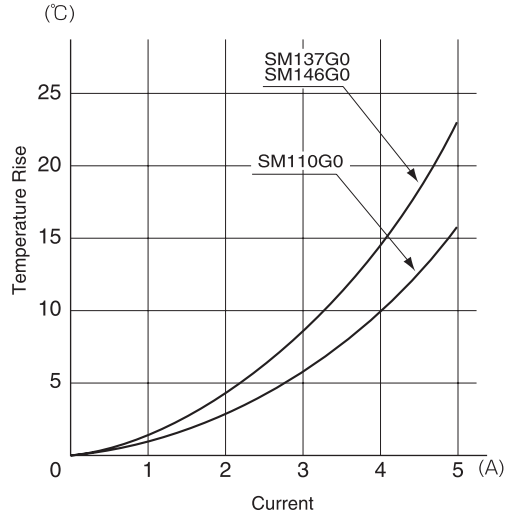


Response Time

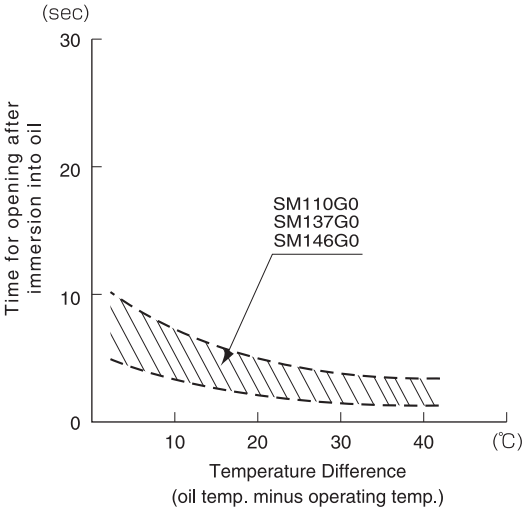


SM/G Series

Temperature Rise



Response Time



Internal resistance and initial operating temperature

Part Number	Internal Resistance (mΩ/25mm)	Operating Temperature (°C)	Part Number	Internal Resistance (mΩ/25mm)	Operating Temperature (°C)
SM072A0	3.7 / 3.9 / 4.1	72 / 73 / 74	SM125A0	2.7 / 2.9 / 3.1	124.4 / 125.4 / 126.4
SM092A0	5.8 / 6.3 / 6.8	90.6 / 91.6 / 92.6	SM137A0	3.8 / 4.3 / 4.8	137 / 138 / 139
SM110A0	2.8 / 3.0 / 3.2	110 / 111 / 112	SM146A0 SM150A0	4.4 / 4.7 / 5.0	145 / 146 / 147

Internal resistance and initial operating temperature

Part Number	Internal Resistance (mΩ/25mm)	Operating Temperature (°C)	Part Number	Internal Resistance (mΩ/25mm)	Operating Temperature (°C)
SM092B0	8 / 9 / 10	90.6 / 91.6 / 92.6	SM137B0	5.6 / 6.1 / 6.6	137 / 138 / 139
SM110B0	4.4 / 4.6 / 4.8	110 / 111 / 112	SM146B0 SM150B0	5.7 / 6.2 / 6.7	145.5 / 146.5 / 147.5
SM125B0	3.8 / 4.2 / 4.6	125 / 126 / 127			

Internal resistance and initial operating temperature

Part Number	Internal Resistance (mΩ/25mm)	Operating Temperature (°C)	Part Number	Internal Resistance (mΩ/25mm)	Operating Temperature (°C)
SM110G0	5 / 6 / 7	110 / 111 / 112	SM146G0	6.4 / 7.2 / 8.0	145.5 / 146.5 / 147.5
SM137G0	6.8 / 7.6 / 8.4	136 / 137 / 138			

Definition of Terms

● Rated Functioning Temperature (Tf)

Rated functioning temperature is the operating temperature of thermal cutoff, measured using the method specified in the safety standard. In the current Electrical Appliance and Material Safety Law of Japan (PSE), the operation should be within the specified operating temperature range of ±7 °C. In various safety standards such as the UL, CSA, VDE, BEAB and CCC, 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 Tf in the UL, CSA, VDE, BEAB and CCC standards.

The rated functioning temperature of the thermal cutoff complies with both standards and is indicated on the body of the thermal cutoff.

● Operating Temperature

Operating temperature is the actual operating temperature range in which the thermal cutoff operates at, when placed inside a constant temperature oven that is increasing at a rate of 0.5 to 1°C/min. with a detection current of 10mA or lower is applied.

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

● Holding Temperature (Th)

Holding temperature is the maximum temperature at which a thermal cutoff continues to conduct a rated current for 168 hours without changing its state of conductivity.

It is represented by the symbol Th in the UL ,CSA , VDE, BEAB and CCC satety standards.

● Maximum Temperature Limit (Tm)

Maximum temperature limit is the temperature up to which the mechanical and electrical characteristics of the thermal cutoff, having change its state of conductivity, will not be impaired during specified time.

It is represented by the symbol Tm in the UL, CSA, VDE, BEAB and CCC safety standards.

Lead Cutting and Taping

SEFUSE®

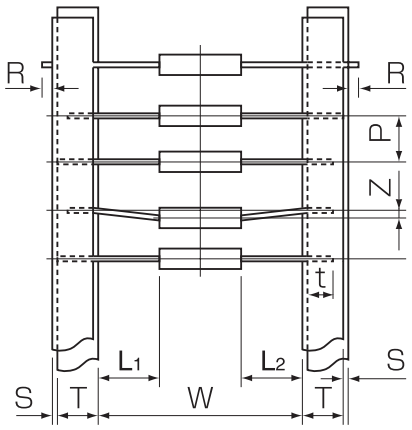
Lead cutting and taping services are available upon request for the following types.

■ Applicable Products

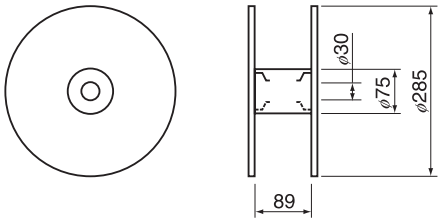
	Standard lead type						Long lead type				
	SF/E SFH/E SF/L	SF/K	SF/Y	SM/A0	SM/B0	SM/G0	SF/E-1 SFH/E-1 SF/L-1	SF/Y-1	SM/A1	SM/B1	SM/G1
Taping	—	○	—	○	○	○	○	—	—	—	—
Lead Cutting	○	○	—	○	○	○	○	—	—	—	—
Lead Forming	○	—	—	—	—	—	○	—	—	—	—

○: available — : not available

Taping



reel



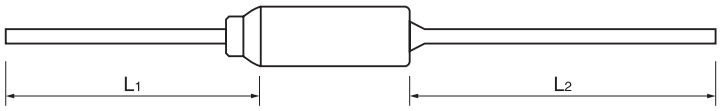
SF/E,SFH/E,SF/L : 2000pcs/reel
SF/K、SM : 2500pcs/reel

(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							

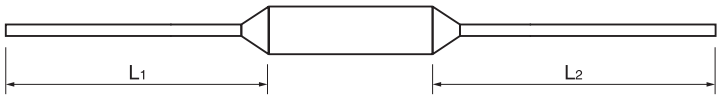
Lead Cutting

●SF Type



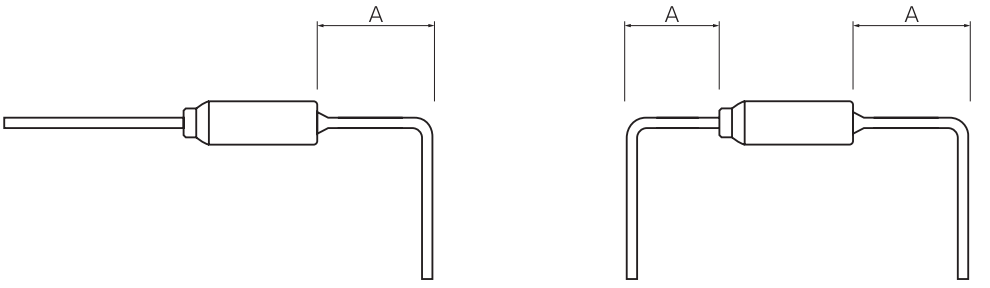
L1 : 9～32
L2 : 7～33 (mm)

●SM Type



L1, L2 : 9～35 (mm)

Lead Forming(SF/E, SFH/E, SF/L)



A: Should be over 5 mm

●For more information on dimensions not described in diagrams above, please contact us.

Packing Quantity

Series	SF/E, SFH/E, SF/Y, SF/L	SF/K	SM/A, SM/B, SM/G	D6X, D6i	D6WX
Packing Quantity in a carton box	5,000pcs/box	6,400pcs/box or 11,200pcs/box	10,000pcs/box	6,400pcs/box	4,800pcs/box

Cautions

SEFUSE®

This section describes points to note, about the design, installation and storage of NEC SCHOTT SEFUSE® thermal cutoffs, so as to achieve the optimum performance of these thermal protection devices.

For optimal thermal cutoff performance, it is recommended that customers correctly stores the thermal protection devices, designs appropriate circuits for the appliances and performs evaluations, mounting and testing steps as necessary. Problems arising from the inappropriate execution of the above would be the sole responsibility of the customer, and NEC SCHOTT declines any and all responsibility.

Design

●Do not use this device for any purpose other than as a thermal cutoff.

The thermal cutoff is designed to detect abnormal rises in temperature and open the electrical circuits as required. It is not a current fuse that cuts off excess current. If thermal cutoff is used as a current fuse, it 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 electrical appliances, office automation equipment, audio and video equipment, computer communications equipment, test and measurement equipment, personal electronic equipment and transportation equipment (excluding engine control).

●Decisions regarding the type of thermal cutoff, the installation location and the mounting method should be made by customers based upon the requirements of the end-application.

It is recommended that designers test the final design with the selected thermal cutoff under both normal conditions as well as predicted worst-case scenario.

▼ Thermal cutoff should be mounted where it can detect abnormal heat as quickly as possible.

The thermal cutoff operates when the thermal element within melts. Therefore, if the thermal element does not reach the operating temperature, the cutoff will not activate even if the ambient temperature has risen to the operating temperature. In addition, a short lag time might result in the event of a sudden rise in the ambient temperature or if the thermal cutoff only detects part of the temperature increase.

▼ Thermal cutoff(*) should be mounted such that the temperature gradient is equal throughout the thermal cutoff.

If lead B of the SF-type, which is caulked to the metal case, is mounted in such a way that it only conducts heat to the metal case, the temperature around the thermal pellet would always be higher than other parts in the metal case. This could lead to the thermal cutoff opening prematurely. Hence, it is recommended that lead A, which is the resin-sealed side, be connected nearer to the heat source.

It should also be mentioned that similarly, if lead A is fixed in a location whereby the temperature it is exposed to is always lower than that of lead B, the thermal cutoff could also be prematurely triggered.

(*) except SFH-E series

●Designers of the end-application should take into account the maximum surface temperature of the thermal cutoff, as shown in Table 1, and avoid exceeding this level.

If the body temperature of the thermal cutoff is exceeded on a regular basis, the thermal cutoff may start operating at temperatures lower than the normal operating temperature. Malfunctions may also occur. In case of using SM-type and D6-type in DC rating, please kindly contact NEC SCHOTT Components Corporation.

Table 1

SM Type		SF Type					
		SF/E, SF/K, SF/Y, SF/L Series				SFH/E Series	
Part Number	Fuse Body Temperature	Part Number	Fuse Body Temperature	Part Number	Fuse Body Temperature	Part Number	Fuse Body Temperature
SM072A	52°C	SF70E, K, Y, L	50°C	SF167L	140°C	SFH106E	86°C
SM092A, B	72°C	SF76E, K, Y, L	56°C	SF169E, Y, L	140°C	SFH109E	89°C
SM110A, B, G	90°C	SF90L	70°C	SF184E, Y, L	140°C	SFH113E	93°C
SM125A, B	106°C	SF91E, K, Y	71°C	SF188E, K, Y, L	140°C	SFH117E	97°C
SM137A, B, G	117°C	SF96E, K, Y, L	76°C	SF214E, K, Y, L	140°C	SFH124E	104°C
SM146A, B, G	126°C	SF113E, Y, L	90°C	SF226E, Y	140°C	SFH129E	109°C
SM150A, B	126°C	SF119E, K, Y, L	99°C	SF229L	140°C	SFH134E	114°C
		SF129E, Y, L	109°C	SF240E, Y, L	140°C	SFH152E	132°C
		SF139E, Y, L	119°C			SFH162E	140°C
		SF152E, Y, L	132°C			SFH172E	140°C

Note that the temperature listed in Table 1 refers to the surface temperature of the thermal cutoff, and not the ambient temperature.

●Thermal cutoffs have a limited life.

The thermal elements used are durable substances designed for long-time usage. However, the longevity of the thermal cutoff depends on the conditions in which it is exposed to. This is particularly true if the thermal protection device is frequently exposed to temperature very close to its operating temperature.

Hence, it is recommended that designers conduct a reliability test by fixing the thermal protection device onto the actual end-application and simulating the expected operating conditions to assess the lifetime of the device.

●The body temperature of the thermal cutoff increases as current passes through it.

The body temperature of the thermal cutoff could rise to levels higher than the ambient temperature as the current passes through the device. In addition, the body temperature could also increase depending on a number of factors such as the mounting method. Hence, it is recommended that designers measure the body temperature of thermal cutoff after conducting a reliability test.

●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, the contacts may be welded together in the SF-type, causing the thermal cutoff to malfunction. In the SM-type and D6-type, the body of the thermal cutoff may rupture.

●Do not use the thermal cutoff in an atmospher out of the standard specifications such as in environments exposed to sulfurous acid gas,nitrogen oxide gas,ammonia gas or conditions that contain formic acid. It is also not suitable for high humidity situations and submersion in a liquid.

The case of the thermal cutoff(*) is made with a copper alloy. Hence, installing the thermal cutoff in such conditions or similar, could deteriorate the sealing resin or lead to cracks in the case of the thermal cutoff due to corrosion. The thermal cutoff could thus operate at lower than operating temperatures or not activate even if its operating temperature is exceeded.

* except SF-Y series, SM-type and D6-type

●The thermal cutoff corresponds to industrial waste.

The thermal cutoff corresponds to industrial waste, and requires disposal according to governmental and provincial regulations. The services of a licensed disposal contractor could also be engaged.

●The thermal cutoff is a non-repairable device.

In case of replacement, an equivalent thermal cutoff from the same manufacturer should be used. For general consumers who are not aware of the cautions associated with the thermal cutoff, they should be informed not to mount, remove or replace the thermal cutoff through a note to this effect in the user's manual and other related materials.

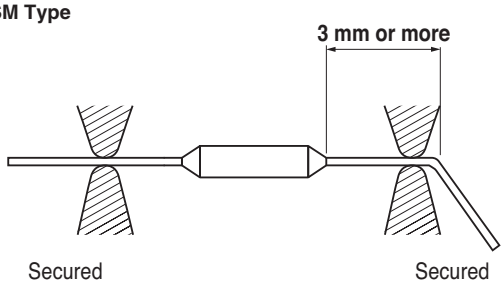
Cautions

SEFUSE®

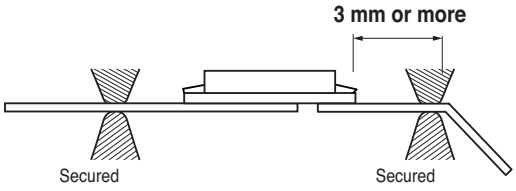
Lead wire process

- When bending the lead wire, it is important not to apply excessive pressure to the root of the lead wire. Therefore, the lead wire should be secured close to the case and bent (not twisted) at a distance 3 mm or more from the body of the fuse.

SF／SM Type



D6 Type



- The tensile strength applied to the lead wire should be **SF-type: 49N or less** and **SM- and D6-types: 9.8N or less**.
- The strength applied to the body of the thermal cutoff should be **SF-type: 98N or less**, **SM-type: 49 N or less, and D6-type: 4.9N or less**.

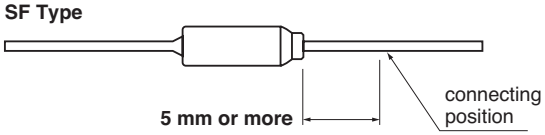
  With regards to the SF-type, deformation of the case may change the location of the sliding contact during operation and could lead to the thermal cutoff operating only at temperatures lower than the normal operating temperature range. The thermal cutoff may also not operate even if the thermal cutoff's operating temperature is exceeded.

Mounting

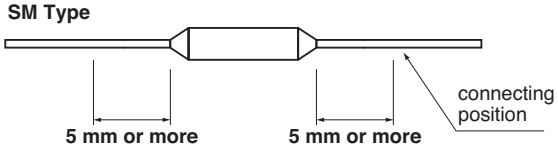
Thermal cutoff can be mounted by soldering, caulking or welding.

- The connecting position at the lead of resin-sealed side should be 5 mm or more from the body of the thermal cutoff.

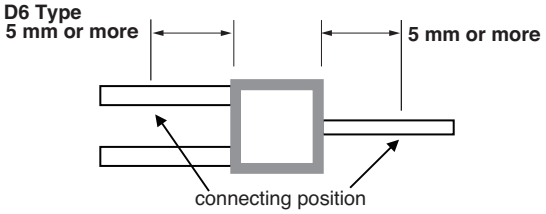
SF Type



SM Type



D6 Type



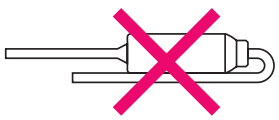
- If soldering, note that the thermal cutoff may function because of excessive solder temperature. To prevent such malfunctions, for example, holding the lead near the case with a tool is effective for allowing the heat to escape and the soldering should be done in short intervals.

  Another effective method is to use a lower solder temperature and to solder at a location that is at a distance 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.

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

- If using a SF-type thermal cutoff, the lead on the resin-sealed side must not be allowed to 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 open 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 metallic part.

Storage

- The body and lead A of the SF-type, and the leads of SM092A and SM092B are silver-plated. Therefore, these parts may discolor because of sulfuration, making the marking of the body difficult to discriminate or negatively affecting the solder-ability of the lead. To avoid this, the thermal cutoff should not be kept around materials (such as cardboard or rubber, etc.) which generate sulfurous acid gas.

- When storage of thermal cutoff in cardboard boxes is required, the pack of thermal cutoffs should be double packed and sealed in bags such as polyethylene.

Recommendation

- NEC SCHOTT recommend the following tests upon receipt and after mounting of the thermal cutoff, as it may have undergone some mechanical load or thermal influence during transportation or when being mounted.

  1. Appearance check
  2. Resistance check (comparing before with after), or conductive check
  3. X-ray inspection
  4. Operation check for sampling

- 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 that the general consumers, who are unaware of the usage cautions for thermal cutoff, be informed not to mount, remove, or replace the thermal cutoff through a note to this effect in the user's manual and other related material.

For any clarifications or more information about these cautions, please kindly contact NEC SCHOTT Components Corporation.

The values contained in this document were obtained under the testing conditions conducted by NEC SCHOTT. These are not guaranteed and are for reference only.

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NEC SCHOTT Components Corporation

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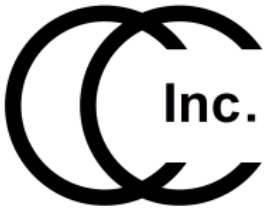

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