

Description

Metal Oxide Varistor (MOV) as one nonlinear resistance element is mainly made of zinc oxide (ZnO), which has very high surge capacity and big nonlinear coefficient. Below the threshold voltage, its resistance is very high, nearly no current flows through, but above the threshold voltage, the resistance reduces sharply, huge current can be discharged. Due to this characteristic, varistor as a protection component in electronic and electrical equipment can absorb abnormal over-voltage and lightning surge.

SETsafe | SETfuse varistor is with High Surge Current Density, Low Clamping Voltage, and Good Surge Capacity. It can also be customized as required.



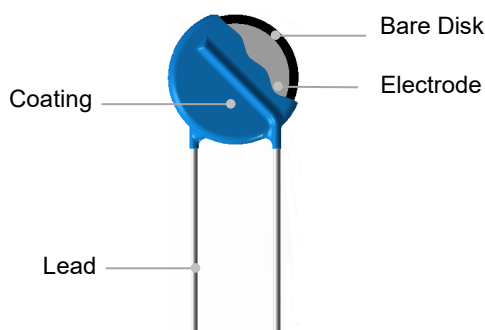
Features

- Epoxy Resin Coating
- Silicone Resin Coating
- Low Leakage Current
- Bidirectional and Symmetrical V/I Characteristics
- RoHS & REACH Compliant
- Operating Temperature Range
Low Temperature: -40 °C
High Temperature: +85 °C / +105 °C

Applications

- Power Supplies
- Home Electrical Appliances
- Industrial Devices
- Surge Protectors
- Telecom Devices

Product Structure



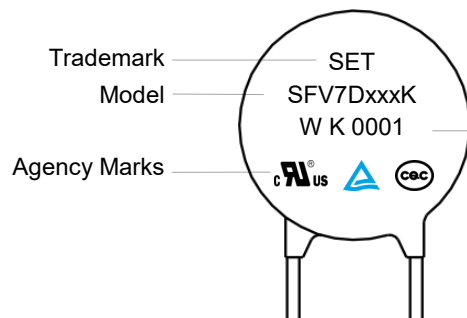
Lead Types

Lead Types		Codes
	Straight Lead	A
	Inward Crimp Lead	B
	Outward Crimp Lead	C
	Inline Crimp Lead	D
	Little Straight Lead	I

Agency Approvals

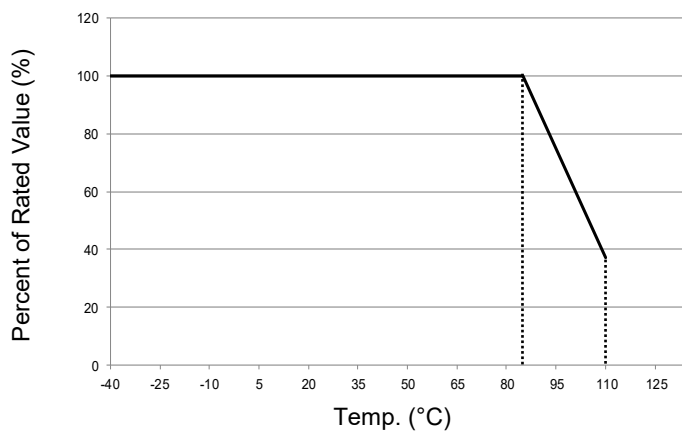
Agency	Standards	No.
	UL 1449 4 th Edition	on request
	CSA C22.2 NO.269.5-17	on request
	EN 61051-1:2008 IEC 61051-1:2007 IEC 61051-2:1991+A1 IEC 61051-2-2:1991	on request
	GB/T 10193-1997 GB/T 10194-1997	on request

Marking



Internal code	
Year Code	2000—A
	
	2022—W
Surge Level	S: Normal Type K: Standard Type
Serial No.	(E.G.: 0001)

Temp. Derating Curve



For Normal Temp. Series

Note:

When ambient Temp. exceeds 85 °C, the peak surge current and energy rating should be reduced as shown in left curve.

General Technical Data

Item	Value	Unit
Operating Temperature	-40 to +85	°C
Storage Temperature	-40 to +125	°C
Voltage Proof	≥2500	V _{ac}
Insulation Resistance	≥100	MΩ

Part Numbering System

SFV 07 D 471 - K T K A BUL - 001

Other Options

*Packaging & Lead Length

BUL: Bulk + Standard Lead Length (Normal L28)

C35: Bulk + Cut to 3.5 mm

(Range: 2.5 mm to 6 mm)

L30: Bulk + Special Lead Length 30 mm

(28 mm to 32 mm)

(0/1)AB: Taping + Box (Hole Pitch 12.7 mm)

(0/1)EB: Taping + Box (Hole Pitch 15.0 mm)

(0/1)AR: Taping + Reel (Hole Pitch 12.7 mm)

(0/1)ER: Taping + Reel (Hole Pitch 15.0 mm)

Note: 0/1 Means Product Position

0: In Middle of Two Holes; 1: Across the Hole

Lead Types

A: Straight Lead

B: Inward Crimp Lead

C: Outward Crimp Lead

D: Inline Crimp Lead

I: Little Straight Lead

Surge Level

S: Normal Type

K: Standard Type

Operating Temp.

N: Epoxy Coating 85 °C

P: Epoxy Coating 105 °C

M: Epoxy Coating 125 °C

T: Silicone Coating 125 °C

Voltage Tolerance

K: ±10%

J: ±5%

S: Special Tolerance

Nominal Varistor Voltage

220: $22 \times 10^0 = 22 \text{ V}$

471: $47 \times 10^1 = 470 \text{ V}$

122: $12 \times 10^2 = 1200 \text{ V}$

Disk Shape

D: Round

Bare Disk Dimension

07: 7 mm

Product Category

SETfuse Varistor

*For more details refer to packaging information.

Glossary

Item	Description
V_N	Nominal Varistor Voltage Voltage, at specified D.C. current used as a reference point in the component characteristics.
I_L	Leakage Current Measuring at 75% of varistor voltage.
UCT	Upper Category Temp. Max. ambient temp. for which a varistor has been designed to operate continuously.
LCT	Lower Category Temp. Minimum ambient temp. at which a varistor has been designed to operate continuously.
Max. Peak Current	Max. Peak Current Max. current per pulse, which may be passed by a varistor at an ambient temp. of 25 °C, for a given number of pulses.
V_C	Clamping Voltage Peak voltage developed across the varistor terminations under standard atmospheric conditions, when passing an 8/20 µs class current pulse.
Voltage Proof	Voltage Proof Max. peak voltage, which may be applied under continuous operating conditions between the varistor terminations and any conducting mounting surface (Applicable only to insulated varistors).
C_V	Capacitance Capacitance across the MOV measured at a specified frequency and voltage.
V_{ac}	Max. Continuous a.c. Voltage Max. a.c. r.m.s. voltage of a substantially sinusoidal waveform (less than 5% total harmonic distortion) which can be applied to the component under continuous operating conditions at 25 °C.
V_{dc}	Max. Continuous d.c. Voltage Max. d.c. voltage (with less than 5% ripple) which can be applied to the component under continuous operating conditions at an ambient temp. of 25 °C.

Specification

Model	Surge Level	Max. Continuous Operating Voltage		Varistor Voltage @1 mA DC		Clamping Voltage (Max.)		Max. Peak Current (1 time, 8/20 μs)	Max. Energy (10/1000 μs)	Typical Capacitance (RFor reference only)	Agency Approvals			
		Vac	Vdc	Min.	Max.	V _C	I _p	S		(pF)				
		(V)	(V)	(V)	(V)	(V)	(A)	(kA)	(J)		UL	cUL	TUV	CQC
SFV7D220K	S	14	18	20	24	43	2.5	0.25	1.1	2300	●	●	●	●
SFV7D270K	S	17	22	24	31	53	2.5	0.25	1.4	1800	●	●	●	●
SFV7D330K	S	20	26	30	36	65	2.5	0.25	1.7	1500	●	●	●	●
SFV7D390K	S	25	31	35	43	77	2.5	0.25	2.1	1300	●	●	●	●
SFV7D470K	S	30	38	42	52	93	2.5	0.25	2.5	1100	●	●	●	●
SFV7D560K	S	35	45	50	62	110	2.5	0.25	3.1	890	●	●	●	●
SFV7D680K	S	40	56	61	75	135	2.5	0.25	3.6	740	●	●	●	●
SFV7D820K	S	50	65	74	90	135	10	1.25	5.5	600	●	●	●	●
SFV7D101K	S	60	85	90	110	165	10	1.25	6.5	500	●	●	●	●
SFV7D121K	S	75	100	108	132	200	10	1.25	7.8	420	●	●	●	●
SFV7D151K	S	95	125	135	165	250	10	1.25	9.7	330	●	●	●	●
SFV7D181K	S	115	150	162	198	300	10	1.25	11.7	280	●	●	●	●
SFV7D201K	S	130	170	180	220	340	10	1.25	13	250	●	●	●	●
SFV7D221K	S	140	180	198	242	360	10	1.25	14	230	●	●	●	●
SFV7D241K	S	150	200	216	264	395	10	1.25	15	210	●	●	●	●
SFV7D271K	S	175	225	243	297	455	10	1.25	18	185	●	●	●	●
SFV7D301K	S	190	250	270	330	500	10	1.25	20	165	●	●	●	●
SFV7D331K	S	210	275	297	363	550	10	1.25	23	150	●	●	●	●
SFV7D361K	S	230	300	324	396	595	10	1.25	25	140	●	●	●	●
SFV7D391K	S	250	320	351	429	650	10	1.25	25	130	●	●	●	●
SFV7D431K	S	275	350	387	473	710	10	1.25	28	115	●	●	●	●
SFV7D471K	S	300	385	423	517	775	10	1.25	30	105	●	●	●	●
SFV7D511K	S	320	415	459	561	845	10	1.25	30	100	●	●	●	●
SFV7D561K	S	350	460	504	616	925	10	1.25	30	90	●	●	●	●
SFV7D621K	S	385	505	558	682	1025	10	1.25	33	80	●	●	●	●
SFV7D681K	S	420	560	612	748	1120	10	1.25	33	75	●	●	●	●
SFV7D751K	S	460	615	675	825	1240	10	1.25	38	70	●	●	●	●
SFV7D821K	S	510	670	738	902	1355	10	1.25	42	65	●	●	●	●

Specification

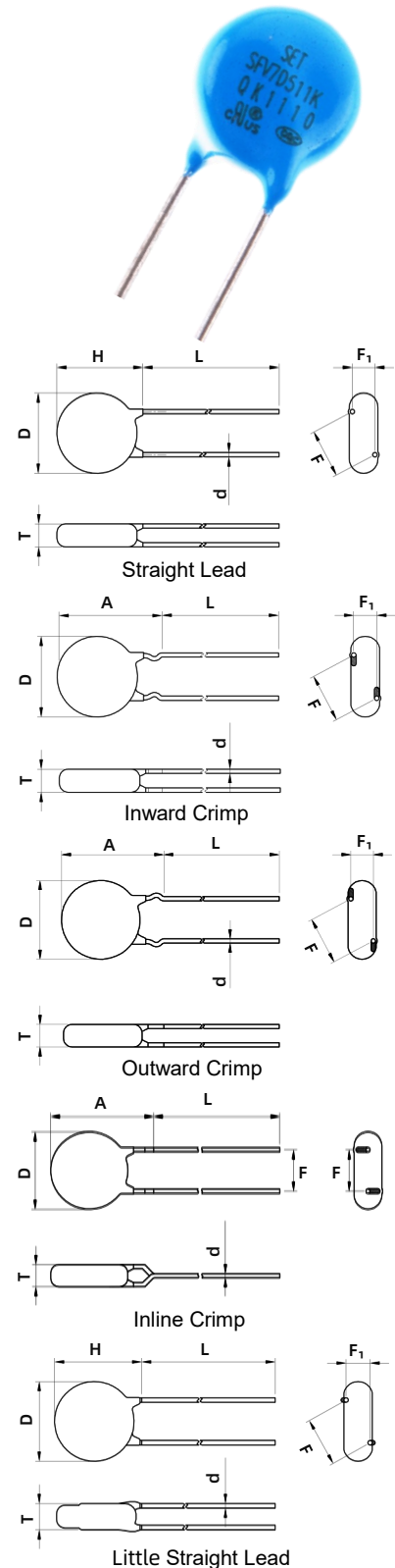
Model	Surge Level	Max. Continuous Operating Voltage		Varistor Voltage @1 mA DC		Clamping Voltage (Max.)		Max. Peak Current (1 time, 8/20 μs)	Max. Energy (10/1000 μs)	Typical Capacitance (RFor reference only) @1 kHz	Agency Approvals			
		Vac	Vdc	Min.	Max.	V _C	I _P	S		(pF)				
		(V)	(V)	(V)	(V)	(V)	(A)	(kA)	(J)		UL	cUL	TUV	CQC
SFV7D220K	K	14	18	20	24	43	2.5	0.5	1.3	2300	●	●	●	●
SFV7D270K	K	17	22	24	31	53	2.5	0.5	1.6	1800	●	●	●	●
SFV7D330K	K	20	26	30	36	65	2.5	0.5	2.0	1500	●	●	●	●
SFV7D390K	K	25	31	35	43	77	2.5	0.5	2.4	1300	●	●	●	●
SFV7D470K	K	30	38	42	52	93	2.5	0.5	2.8	1100	●	●	●	●
SFV7D560K	K	35	45	50	62	110	2.5	0.5	3.4	890	●	●	●	●
SFV7D680K	K	40	56	61	75	135	2.5	0.5	4.1	740	●	●	●	●
SFV7D820K	K	50	65	74	90	135	10	1.75	7.0	600	●	●	●	●
SFV7D101K	K	60	85	90	110	165	10	1.75	8.5	500	●	●	●	●
SFV7D121K	K	75	100	108	132	200	10	1.75	10	420	●	●	●	●
SFV7D151K	K	95	125	135	165	250	10	1.75	13	330	●	●	●	●
SFV7D181K	K	115	150	162	198	300	10	1.75	15	280	●	●	●	●
SFV7D201K	K	130	170	180	220	340	10	1.75	17.5	250	●	●	●	●
SFV7D221K	K	140	180	198	242	360	10	1.75	19	230	●	●	●	●
SFV7D241K	K	150	200	216	264	395	10	1.75	21	210	●	●	●	●
SFV7D271K	K	175	225	243	297	455	10	1.75	24	185	●	●	●	●
SFV7D301K	K	190	250	270	330	500	10	1.75	26	165	●	●	●	●
SFV7D331K	K	210	275	297	363	550	10	1.75	28	150	●	●	●	●
SFV7D361K	K	230	300	324	396	595	10	1.75	32	140	●	●	●	●
SFV7D391K	K	250	320	351	429	650	10	1.75	35	130	●	●	●	●
SFV7D431K	K	275	350	387	473	710	10	1.75	40	115	●	●	●	●
SFV7D471K	K	300	385	423	517	775	10	1.75	42	105	●	●	●	●
SFV7D511K	K	320	415	459	561	845	10	1.75	45	100	●	●	●	●
SFV7D561K	K	350	460	504	616	925	10	1.75	49	90	●	●	●	●
SFV7D621K	K	385	505	558	682	1025	10	1.75	55	80	●	●	●	●
SFV7D681K	K	420	560	612	748	1120	10	1.75	60	75	●	●	●	●
SFV7D751K	K	460	615	675	825	1240	10	1.75	66	70	●	●	●	●
SFV7D821K	K	510	670	738	902	1355	10	1.75	71	65	●	●	●	●

Dimensions (mm)

Model	L (Min.)	H (Max.)	T (Max.)	D (Max.)	d	F	F ₁	A (Max.)
SFV7D220K	20	12	4.1	9.0	0.60±0.05	5.0±0.6	1.0 - 2.3	12.5
SFV7D270K	20	12	4.4	9.0	0.60±0.05	5.0±0.6	1.1 - 2.5	12.5
SFV7D330K	20	12	4.7	9.0	0.60±0.05	5.0±0.6	1.2 - 2.7	12.5
SFV7D390K	20	12	5.0	9.0	0.60±0.05	5.0±0.6	1.3 - 2.9	12.5
SFV7D470K	20	12	4.2	9.0	0.60±0.05	5.0±0.6	1.1 - 2.5	12.5
SFV7D560K	20	12	4.4	9.0	0.60±0.05	5.0±0.6	1.2 - 2.7	12.5
SFV7D680K	20	12	4.7	9.0	0.60±0.05	5.0±0.6	1.4 - 3.0	12.5
SFV7D820K	20	12	4.0	9.0	0.60±0.05	5.0±0.6	1.1 - 2.4	12.5
SFV7D101K	20	12	4.2	9.0	0.60±0.05	5.0±0.6	1.2 - 2.6	12.5
SFV7D121K	20	12	4.4	9.0	0.60±0.05	5.0±0.6	1.3 - 2.8	12.5
SFV7D151K	20	12	4.7	9.0	0.60±0.05	5.0±0.6	1.4 - 3.1	12.5
SFV7D181K	20	12	4.0	9.0	0.60±0.05	5.0±0.6	1.1 - 2.5	12.5
SFV7D201K	20	12	4.2	9.0	0.60±0.05	5.0±0.6	1.2 - 2.7	12.5
SFV7D221K	20	12	4.3	9.0	0.60±0.05	5.0±0.6	1.3 - 2.8	12.5
SFV7D241K	20	12	4.4	9.0	0.60±0.05	5.0±0.6	1.3 - 2.9	12.5
SFV7D271K	20	12	4.5	9.0	0.60±0.05	5.0±0.6	1.4 - 3.0	12.5
SFV7D301K	20	12	4.7	9.0	0.60±0.05	5.0±0.6	1.5 - 3.2	12.5
SFV7D331K	20	12	4.9	9.0	0.60±0.05	5.0±0.6	1.6 - 3.3	12.5
SFV7D361K	20	12	5.0	9.0	0.60±0.05	5.0±0.6	1.7 - 3.5	12.5
SFV7D391K	20	12	5.2	9.0	0.60±0.05	5.0±0.6	1.9 - 3.7	12.5
SFV7D431K	20	12	5.4	9.0	0.60±0.05	5.0±0.6	2.0 - 3.9	12.5
SFV7D471K	20	12	5.7	9.0	0.60±0.05	5.0±0.6	2.1 - 4.1	12.5
SFV7D511K	20	12	5.9	9.0	0.60±0.05	5.0±0.6	2.3 - 4.3	12.5
SFV7D561K	20	12	6.2	9.0	0.60±0.05	5.0±0.6	2.5 - 4.5	12.5
SFV7D621K	20	12	6.5	9.0	0.60±0.05	5.0±0.6	2.9 - 4.9	12.5
SFV7D681K	20	12	6.8	9.0	0.60±0.05	5.0±0.6	3.2 - 5.2	12.5
SFV7D751K	20	12	7.2	9.0	0.60±0.05	5.0±0.6	3.5 - 5.5	12.5
SFV7D821K	20	12	7.6	9.0	0.60±0.05	5.0±0.6	3.9 - 5.9	12.5

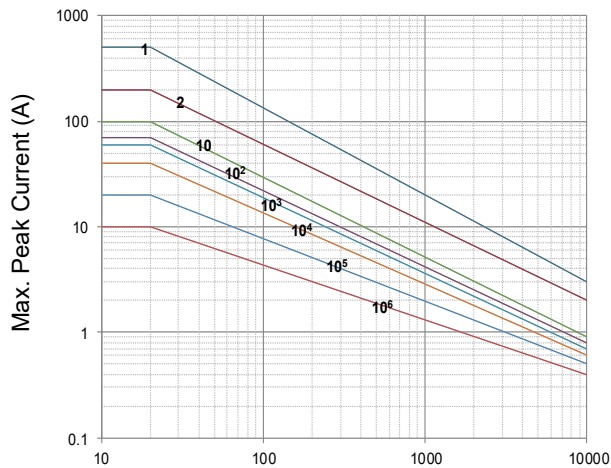
Note:

The above data is for reference only.



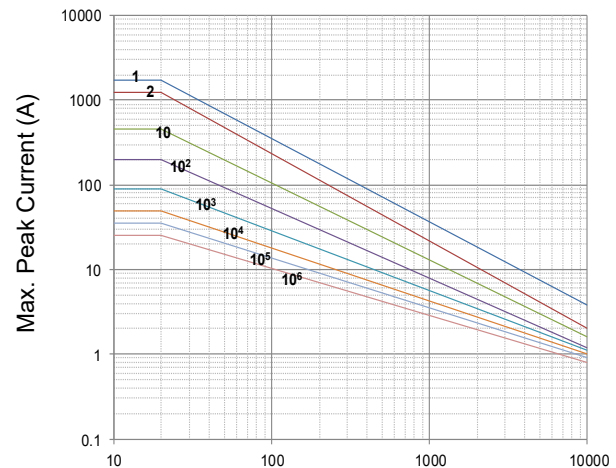
Performance Curve (For reference only)

- Max. Peak Current Derating Curves



Impulse Duration (μs)

SFV7D220K to SFV7D680K

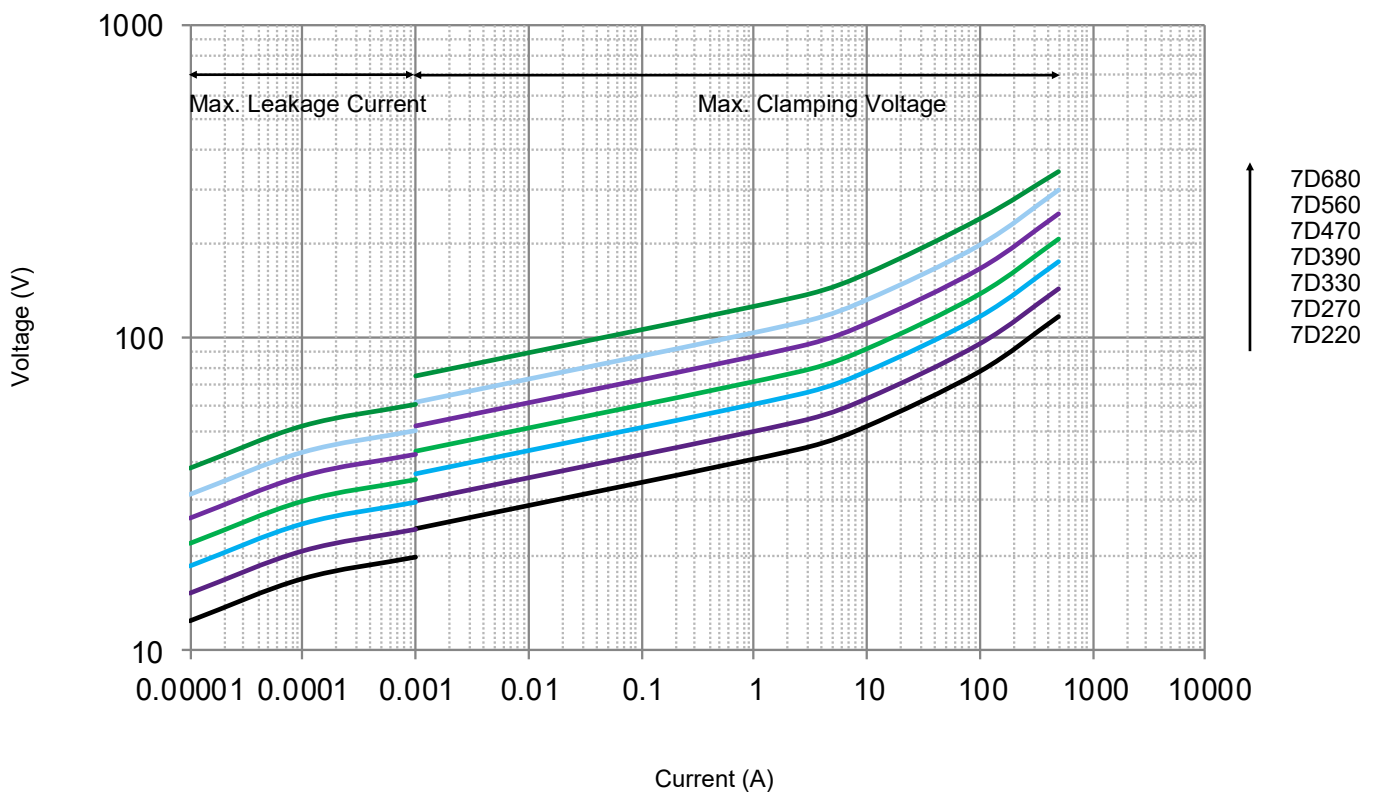


Impulse Duration (μs)

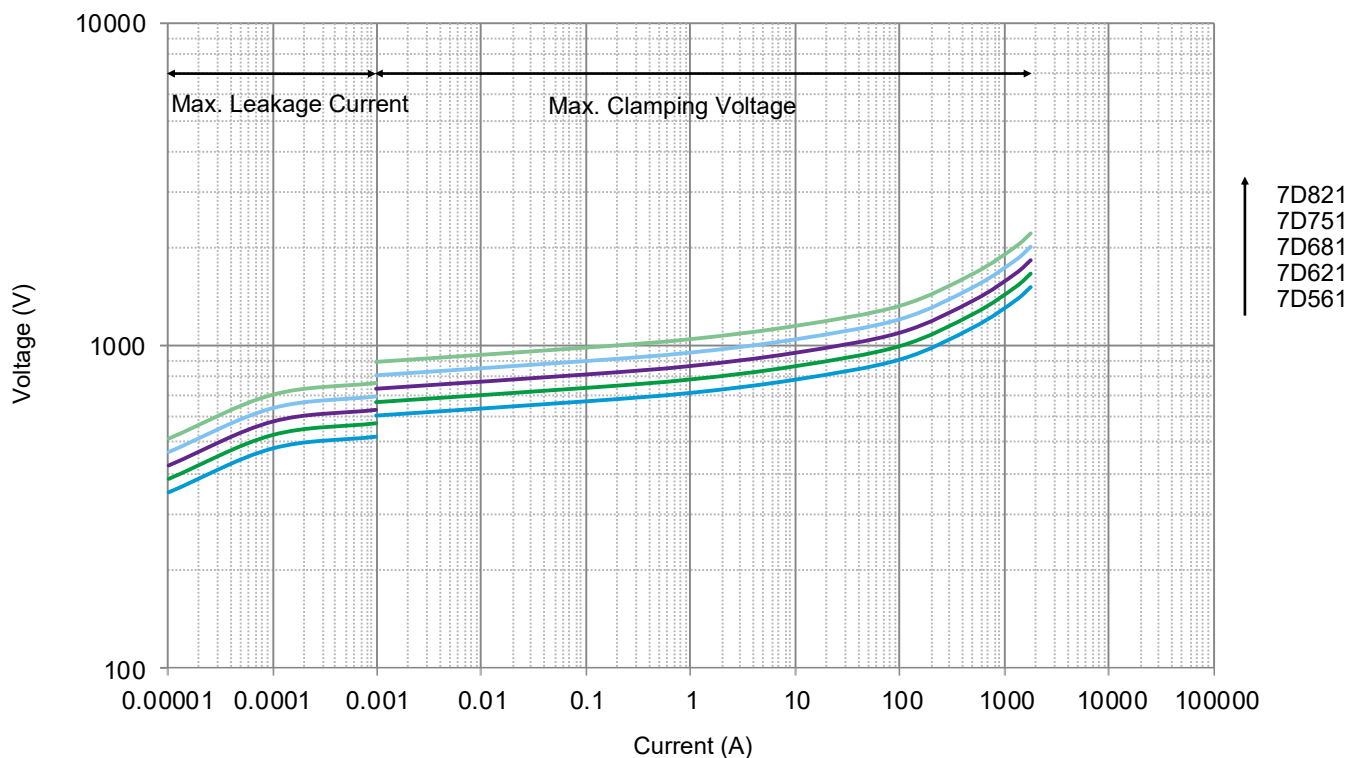
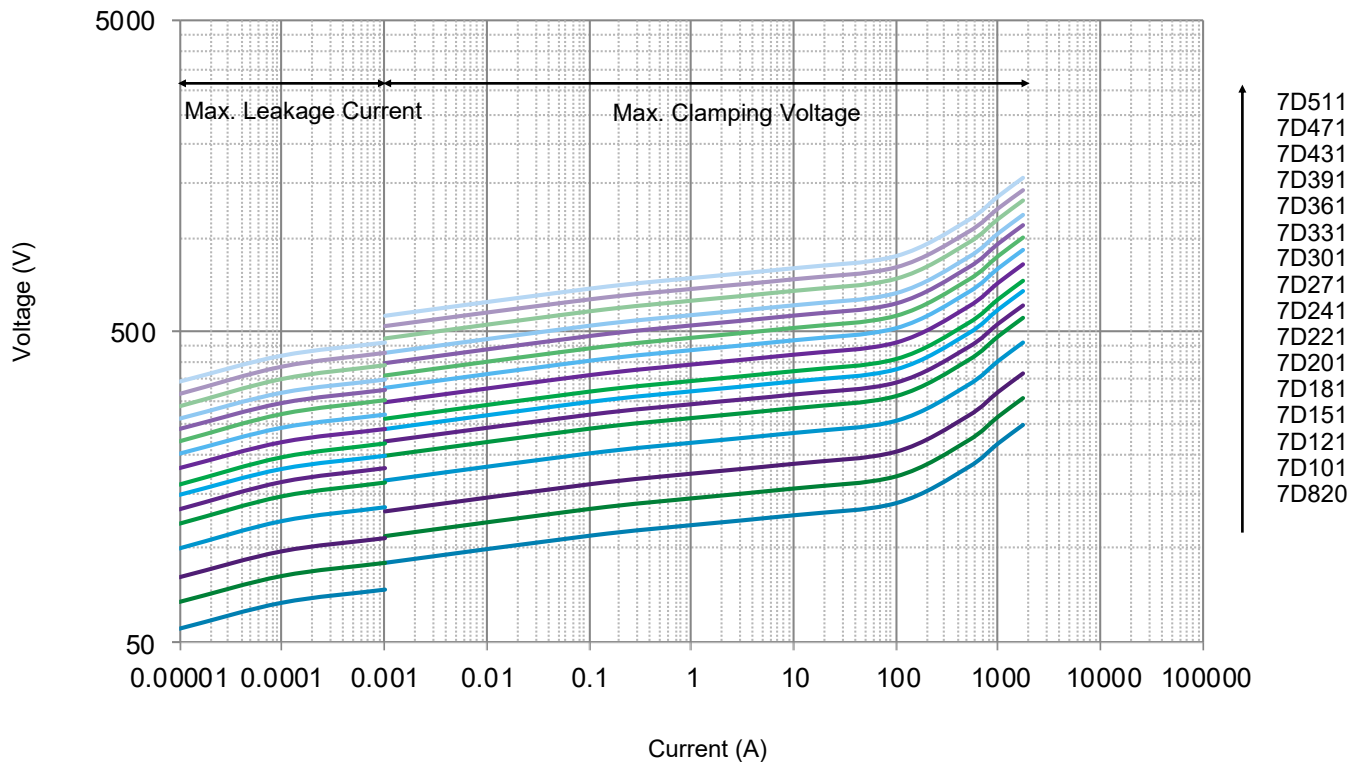
SFV7D820K to SFV7D821K

Note: 1, 2, 10, 10², 10³, 10⁴, 10⁵, 10⁶ Stand for Repetitions.

- Voltage-Current Characteristic Curves



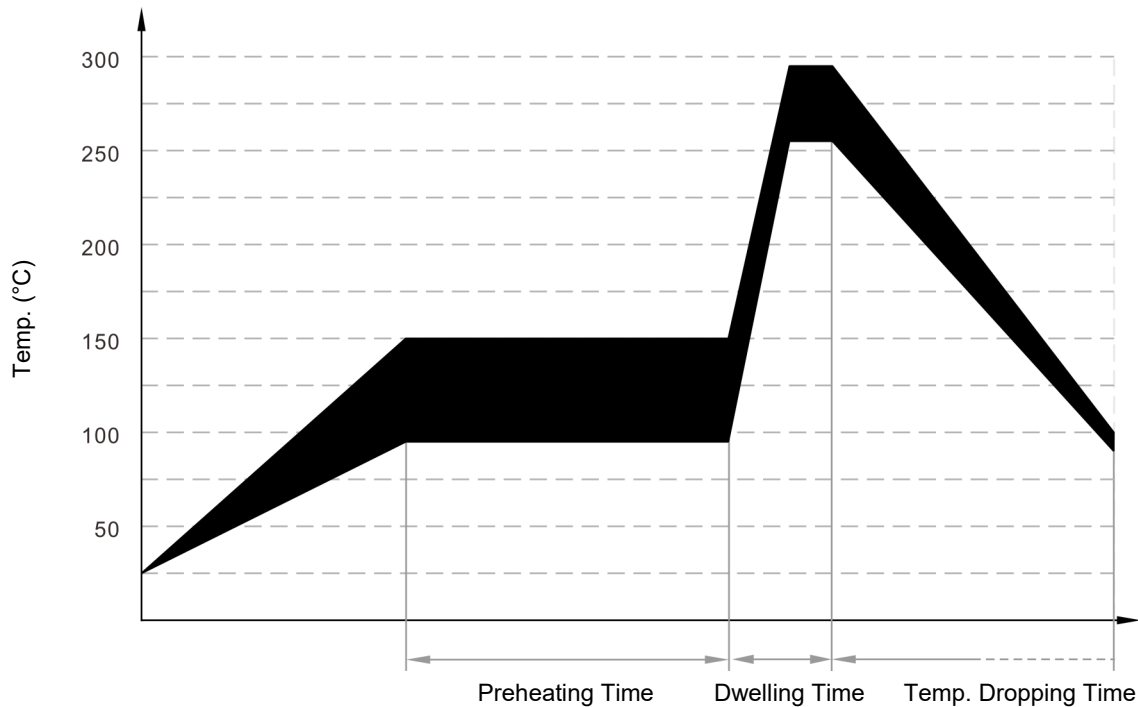
- Voltage-Current Characteristic Curves



Soldering Parameters

Wave Soldering Parameters

The wave soldering parameters are for reference only. When MOV is for practice use, some related validation is recommended.



Wave Soldering Curve

Item	Temp. (°C)	Time (s)
Preheating	90 to 150	<150
Dwelling	255 to 290	3 to 10

Recommended Hand-Soldering Parameters

Item	Condition
Temp. of Solder Head	350 °C (max.)
Soldering Time	4 seconds (max.)

Packaging Information

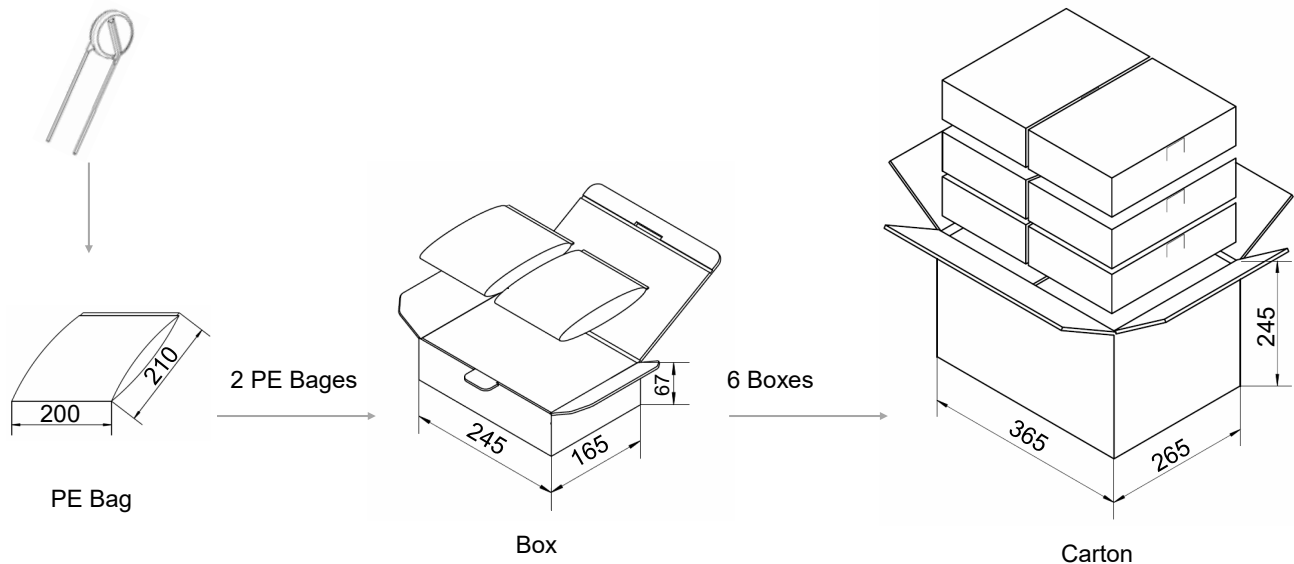
- Bulk Packaging (Code: BUL)
- Bulk Packaging Quantity & Weight.

Series	Nominal Varistor Voltage	PE Bag	Box	Carton	G. W / Carton (365 × 265 × 245)
7D	(V)	(PCS)	(PCS)	(PCS)	(kg)±10%
	220 - 471	1000	2000	12000	5 - 11
	511 - 821	800	1600	9600	8 - 13

Note:

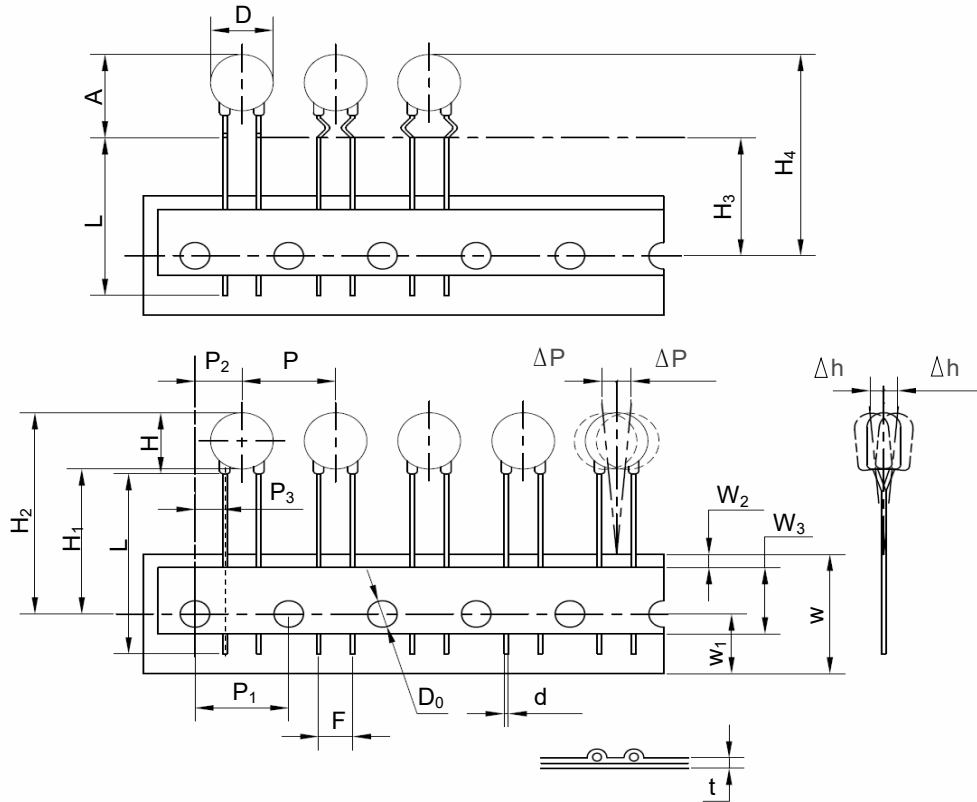
Other lead length packaging information, please contact SETsafe | SETfuse.

All Dimensions in mm



Packaging Information

- Tape Packaging (Code: 0AB)

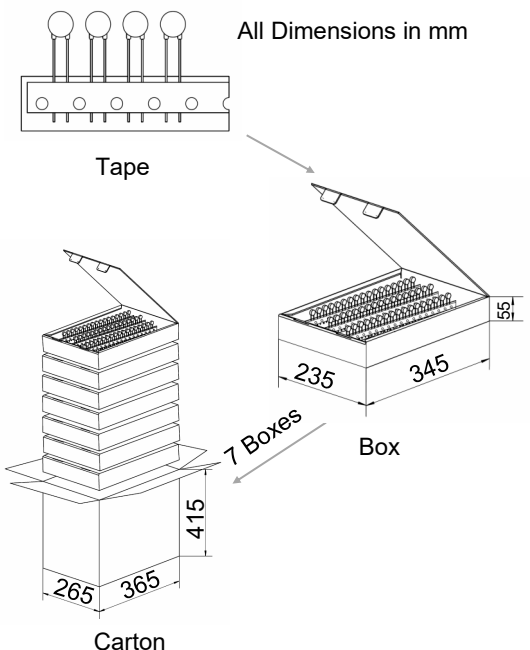


Dimensions (mm)

Symbol	Dimensions
P	12.7±1.0
P ₁	12.7±0.3
P ₂	6.35±1.30
P ₃	3.85±1.00
ΔP(max.)	1.0
W	18.0±2.0
W ₁	9.0±1.0
W ₂ (max.)	3.0
W ₃	10.0±2.0
H(max.)	12.0
H ₁	18.0 ^{+2.0} ₋₀
H ₂ (max.)	32.0
H ₃	18.0 ^{+2.0} ₋₀
H ₄ (max.)	33.0
Δh(max.)	2.0
t(max.)	0.6
D(max.)	9.0
D ₀	4.0±0.2
d	0.60±0.05
A(max.)	12.5
F	5.0±1.0
L(min.)	Taping

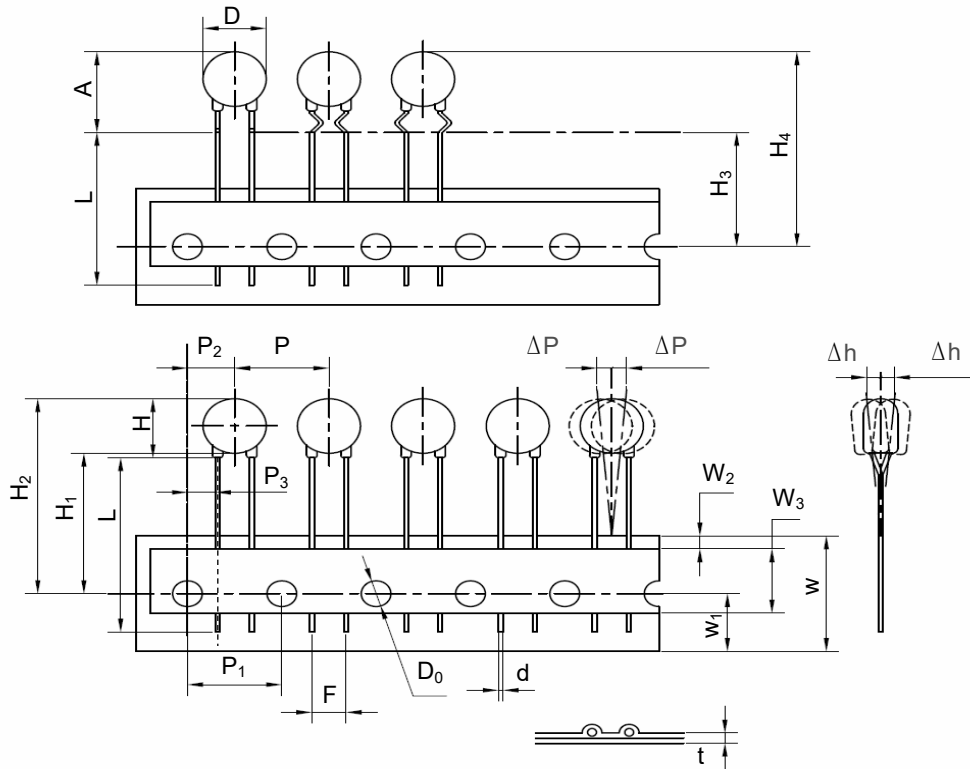
- Tape Packaging Quantity & Weight.

Series	Nominal Varistor Voltage	Box	Carton	G. W / Carton (365 × 265 × 415)
	(V)	(PCS)	(PCS)	(kg)±10%
7D	751 - 821	700	4900	6 - 7
	511 - 681	800	5600	5 - 6
	331 - 471	1000	7000	4 - 6
	820 - 301	1200	8400	4 - 6



Packaging Information

- Reel Packaging (Code:0AR)

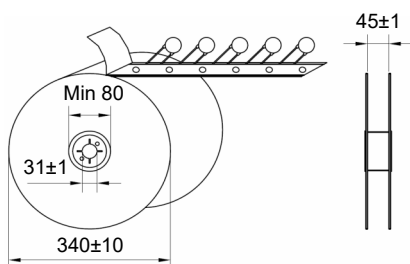
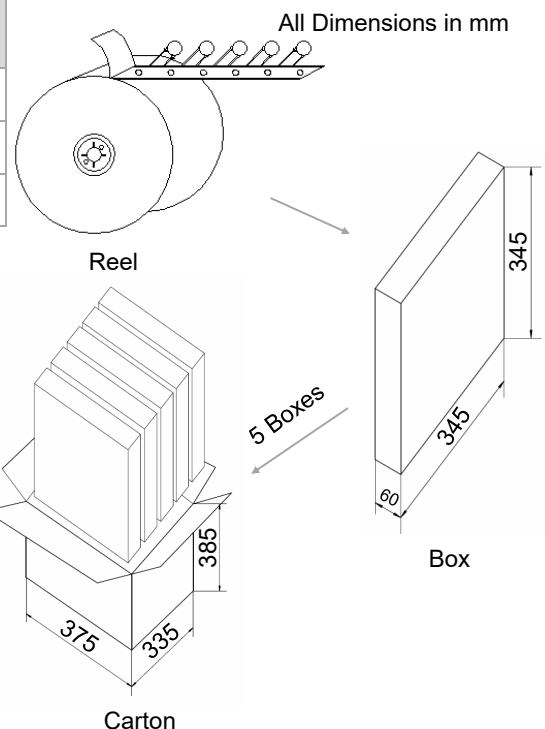


Dimensions (mm)

Symbol	Dimensions
P	12.7±1.0
P ₁	12.7±0.3
P ₂	6.35±1.30
P ₃	3.85±1.00
ΔP(max.)	1.0
W	18.0±1.0
W ₁	9.0±1.0
W ₂ (max.)	3.0
W ₃	10.0±2.0
H(max.)	12.0
H ₁	18.0 ^{+2.0} ₋₀
H ₂ (max.)	32.0
H ₃	18.0 ^{+2.0} ₋₀
H ₄ (max.)	33.0
Δh(max.)	2.0
t(max.)	0.6
D(max.)	9.0
D ₀	4.0±0.2
d	0.60±0.05
A(max.)	12.5
F	5.0±1.0
L(min.)	Taping

- Reel Packaging Quantity & Weight.

Series	Nominal Varistor Voltage	Box	Carton	G. W / Carton (375 × 335 × 385)
	(V)	(PCS)	(PCS)	(kg)±10%
7D	820 - 391	1500	7500	3 - 6
	431 - 821	1000	5000	4 - 7





ATTENTION

MOV

MOV

Usage

1. Varistor must operated in the specified ambient temp.
2. Do not clean the varistor with strong polar solvent such as ketone, esters, benzene and halogenated hydrocarbon.
3. Please do not apply severe vibration, shock or pressure to MOV.
4. Please fix lead wires when bending or cutting. The distance between the bending point and the sealing of MOV shall be greater than 2 mm.

Replacement

If varistor is visually damaged, please replace it.

Storage

1. Storage Temp. Range: (-40 to +125) °C
2. Relative Humidity : ≤75% RH
3. Altitude: <2000 m
4. Do not store the MOV at the high temp., high humidity or corrosive gas environment, to avoid influencing the solder-ability of the lead wires, the product shall be used up within 1 year after receiving the goods.

Environmental Conditions

1. Varistor should neither be exposed to the open air, nor direct sunshine.
2. Varistor should avoid rain, water vapor or other condition of high temp. and high humidity.
3. Varistor should avoid sand dust, salt spray, or other harmful gases.

Max. Typical Capacitance of Varistor

The typical capacitance of varistor is listed in the specifications. Designers may refer to it when designing MOV in high frequency circuit.

Installation

Mechanical Stress

Do not knock MOV when installing, to avoid mechanical damage.