High-Temperature Epoxy Resin
Metal Oxide Varistor

◆ Product Introduction

The high-temperature epoxy resin is encapsulated in a modified, high-temperature resistant, flame-retardantepoxy resin. It has a temperature limit of 125°C and is resistant to thermal and cold shock, preventing crackingThe surge protection device offers excellent resistance to moisture and fire, stable surge absorption performance,and a significant cost advantage. It is suitable for a wide range of high-temperature industrial and power equipment, providing overvoltage protection.

◆ Features

1. The nominal voltage (V_{1ma}) range is wide: 180V ~ 560V
2. Fast response speed for transient overvoltage
3. Strong ability to absorb transient surge energy.
4. Low clamping ratio, no follow-up flow
5. Complies with J-STD-020 standard, moisture sensitivity level MSL 1
6. Operating temperature range: -40℃ ~ +125℃
7. Storage temperature: -40℃ ~ +125℃
8. Safety Certification: UL Certification Number E327997

◆ Application

1. Protection for semiconductor devices such as transistors, diodes, integrated circuits, thyristors, and bidirectional thyristorsSurge
2. Surge protection for consumer electronics
3. Surge protection for industrial electronic products
4. Surge protection for household appliances and oil and gas equipment throughout the entire machine
5. Relays and solenoid valves absorb surge suction

◆ Coding principle

1	2	3	4		5		6	7	10		11		12	13
Varistor voltage			Tolerance		Type		Component diameter		Impact series		Wire shape		Packaging method	
181	18V		K	±10%	K	High-temperature	07	Φ07mm	Without suffix	Standard type	No rear	Straight lead	Without suffix	Bulk
561	560V						10	Φ10mm	J	High wave type	O	External crimping leads	TB	Tape & Box & P0=12.7mm
							14	Φ14mm			F	Y-shaped curved wire	TR	Tape & Reel & P0=12.7mm
							20	Φ20mm					EB	Tape & Box & P0=15.0mm
													ER	Tape & Reel & P0=15.0mm

◆ KK/KK-J series

● Structure and dimensions -07D KK/KK-J

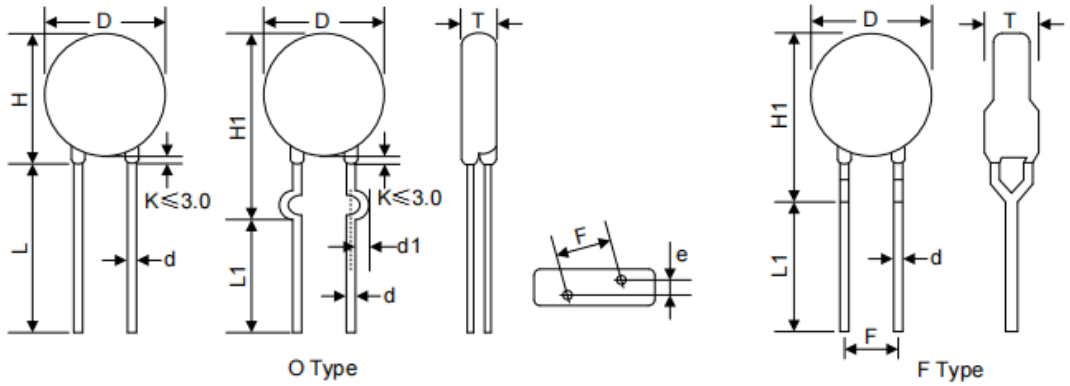


Table 1

Units: mm

Symbols	Dimensions
H(max.)	12.0
H1(max.)	13.5
L(min.)	20.0
L1(min.)	15.0
D(max.)	9.0
F(±0.8)	5.0
T	Table 2
e(±0.8)	Table 2
d(±0.05)	0.6
d1(±0.4)	1.2

Table 2

Units: mm

Model	T	e	Model	T	e
181K	4.3	1.7	391K	5.4	2.6
201K	4.4	1.8	431K	5.7	2.8
221K	4.5	1.9	471K	6.0	3.0
241K	4.6	2.0	511K	6.2	3.2
271K	4.9	2.2	561K	6.5	3.4
301K	5.0	2.3			
331K	5.1	2.3			
361K	5.2	2.5			

◆ KK/KK-J Series

● Electrical Characteristics -07D KK/KK-J

Part Number		Maximum allowed voltage		Varistor Voltage	Maximum holding voltage		Able to withstand surges Current		Maximum energy (10/1000μs)		Rated power	Typical capacitors (Reference value)
Standard	High impact	VAC (V)	VDC (V)	V1mA (V)	IP (A)	VC (V)	I (A) Standard	Standard	High impact	VAC (V)	(W)	@1KHz (pf)
181KK07	181KK07J	115	150	180(162~198)	10	300	1200	1750	11.7	16.0	0.25	280
201KK07	201KK07J	130	170	200(180~220)	10	340	1200	1750	13.0	17.0	0.25	250
221KK07	221KK07J	140	180	220(198~242)	10	360	1200	1750	14.0	19.0	0.25	230
241KK07	241KK07J	150	200	240(216~264)	10	395	1200	1750	15.0	21.0	0.25	210
271KK07	271KK07J	175	225	270(243~297)	10	455	1200	1750	18.0	24.0	0.25	185
301KK07	301KK07J	190	250	300(270~330)	10	500	1200	1750	20.0	26.0	0.25	165
331KK07	331KK07J	210	275	330(297~363)	10	550	1200	1750	23.0	28.0	0.25	150
361KK07	361KK07J	130	300	360(324~396)	10	595	1200	1750	24.0	32.0	0.25	140
391KK07	391KK07J	150	320	390(351~429)	10	650	1200	1750	26.0	35.0	0.25	130
431KK07	431KK07J	175	350	430(387~473)	10	710	1200	1750	28.0	40.0	0.25	115
471KK07	471KK07J	300	385	470(423~517)	10	775	1200	1750	29.0	42.0	0.25	105
511KK07	511KK07J	320	415	510(459~561)	10	845	1200	1750	31.0	45.0	0.25	100
561KK07	561KK07J	350	460	560(504~616)	10	925	1200	1750	35.0	49.0	0.25	90

Note: Leakage current (applied 83% of nominal V1mA voltage): IR ≤ 25μA

◆ KK/KK-J series

● Structure and dimensions-10D KK/KK-J

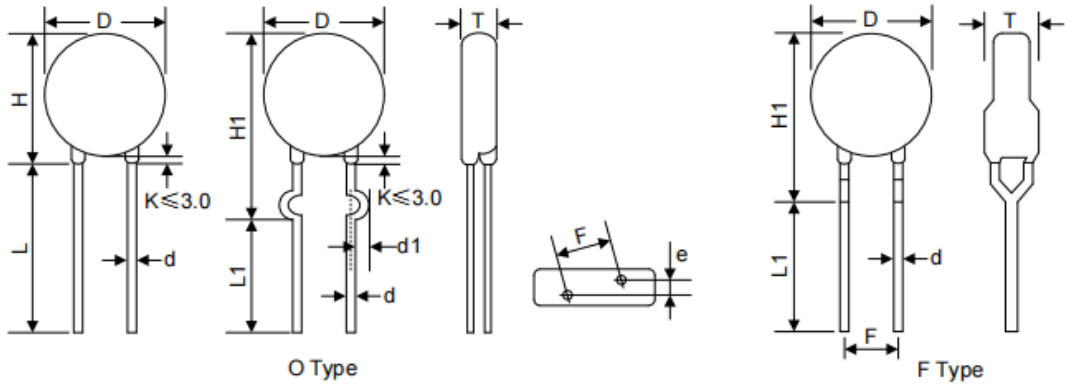


Table 1
Units: mm

Symbols	Dimensions
H(max.)	16.0
H1(max.)	17.5
L(min.)	20.0
L1(min.)	15.0
D(max.)	12.5
F(±0.8)	7.5
T(max.)	Table 2
e(±0.8)	Table 2
d(±0.05)	0.8
d1(±0.4)	1.4

Table 2
Units:mm

Model	T	e	Model	T	e
181K	4.8	1.9	391K	6.2	2.8
201K	5.0	2.0	431K	6.5	3.0
221K	5.1	2.1	471K	6.7	3.2
241K	5.2	2.2	511K	6.8	3.4
271K	5.4	2.4	561K	7.0	3.6
301K	55	2.5			
331K	5.8	2.5			
361K	6.0	2.7			

◆ KK/KK-J Series

● Electrical Characteristics -10D KK/KK-J

Part Number		Maximum allowed voltage		Varistor Voltage	Maximum holding voltage		Able to withstand surges Current		Maximum energy (10/1000 μs)		Rated power	Typical capacitors (Reference value)
Standard	High impact	VAC (V)	VDC (V)	V1mA (V)	IP (A)	VC (V)	I (A) Standard	Standard	High impact	VAC (V)	(W)	@1KHz (pf)
181KK10	181KK10J	115	150	180(162~198)	25	300	2500	3500	27.0	30.0	0.4	560
201KK10	201KK10J	130	170	200(180~220)	25	340	2500	3500	30.0	35.0	0.4	500
221KK10	221KK10J	140	180	220(198~242)	25	360	2500	3500	32.0	39.0	0.4	450
241KK10	241KK10J	150	200	240(216~264)	25	395	2500	3500	35.0	42.0	0.4	420
271KK10	271KK10J	175	225	270(243~297)	25	455	2500	3500	37.0	49.0	0.4	370
301KK10	301KK10J	190	250	300(270~330)	25	500	2500	3500	40.0	54.0	0.4	330
331KK10	331KK10J	210	275	330(297~363)	25	550	2500	3500	43.0	58.0	0.4	300
361KK10	361KK10J	130	300	360(324~396)	25	595	2500	3500	47.0	65.0	0.4	280
391KK10	391KK10J	150	320	390(351~429)	25	650	2500	3500	60.0	70.0	0.4	260
431KK10	431KK10J	175	350	430(387~473)	25	710	2500	3500	65.0	80.0	0.4	230
471KK10	471KK10J	300	385	470(423~517)	25	775	2500	3500	67.0	85.0	0.4	210
511KK10	511KK10J	320	415	510(459~561)	25	845	2500	3500	69.0	90.0	0.4	200
561KK10	561KK10J	350	460	560(504~616)	25	925	2500	3500	70.0	92.0	0.4	180

Note: Leakage current (applied 83% of nominal V1mA voltage): IR ≤ 25μA

◆ KK/KK-J series

● Structure and dimensions -14D KK/KK-J

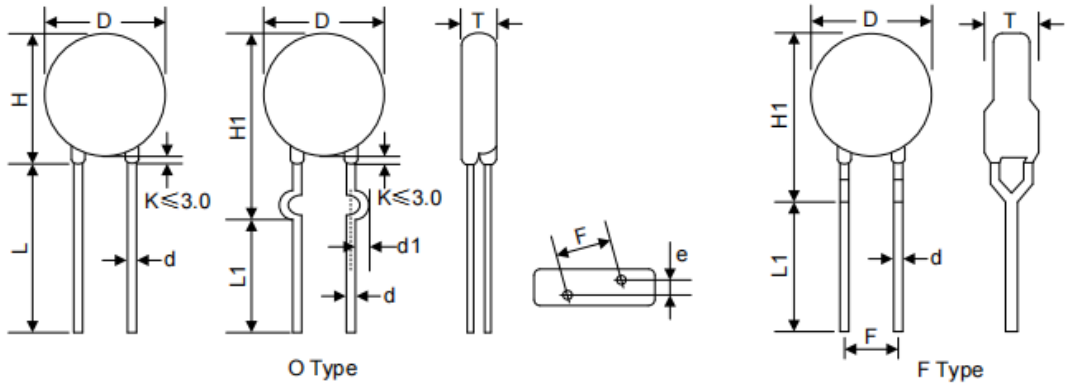


Table 1

Units:mm

Symbols	Dimensions
H(max.)	20.0
H1(max.)	21.0
L(min.)	20.0
L1(min.)	15.0
D(max.)	16.5
F(±0.8)	7.5
T(max.)	Table 2
e(±0.8)	Table 2
d(±0.05)	0.8
d1(±0.4)	1.4

Table 2

Units: mm

Model	T	e	Model	T	e
181K	4.2	1.9	391K	5.4	2.8
201K	4.3	2.0	431K	5.6	3.0
221K	4.4	2.1	471K	5.8	3.2
241K	4.5	2.2	511K	6.1	3.4
271K	4.6	2.4	561K	6.4	3.6
301K	4.6	2.5			
331K	5.0	2.5			
361K	5.2	2.7			

◆ KK/KK-J series

● Electrical Characteristics -14D KK/KK-J

Part Number		Maximum allowed voltage		Varistor Voltage	Maximum holding voltage		Able to withstand surges Current		Maximum energy (10/1000μs)		Rated power	Typical capacitors (Reference value)
Standard	High impact	VAC (V)	VDC (V)	V1mA (V)	IP (A)	VC (V)	I (A) Standard	Standard	High impact	VAC (V)	VDC (V)	V1mA (V)
181KK14	181KK14J	115	150	180(162~198)	50	300	4500	6000	50.0	60.0	0.6	1100
201KK14	201KK14J	130	170	200(180~220)	50	340	4500	6000	57.0	70.0	0.6	1000
221KK14	221KK14J	140	180	220(198~242)	50	360	4500	6000	60.0	78.0	0.6	900
241KK14	241KK14J	150	200	240(216~264)	50	395	4500	6000	63.0	84.0	0.6	830
271KK14	271KK14J	175	225	270(243~297)	50	455	4500	6000	70.0	99.0	0.6	740
301KK14	301KK14J	190	250	300(270~330)	50	500	4500	6000	77.0	108	0.6	670
331KK14	331KK14J	210	275	330(297~363)	50	550	4500	6000	85.0	115	0.6	610
361KK14	361KK14J	130	300	360(324~396)	50	595	4500	6000	93.0	130	0.6	560
391KK14	391KK14J	150	320	390(351~429)	50	650	4500	6000	100	140	0.6	510
431KK14	431KK14J	175	350	430(387~473)	50	710	4500	6000	115	155	0.6	460
471KK14	471KK14J	300	385	470(423~517)	50	775	4500	6000	118	175	0.6	430
511KK14	511KK14J	320	415	510(459~561)	50	845	4500	6000	121	180	0.6	390
561KK14	561KK14J	350	460	560(504~616)	50	925	4500	6000	125	185	0.6	360

Note: Leakage current (applied 83% of nominal V1mA voltage): IR ≤ 25μA

◆ KK/KK-J series

● Structure and dimensions -20D KK/KK-J

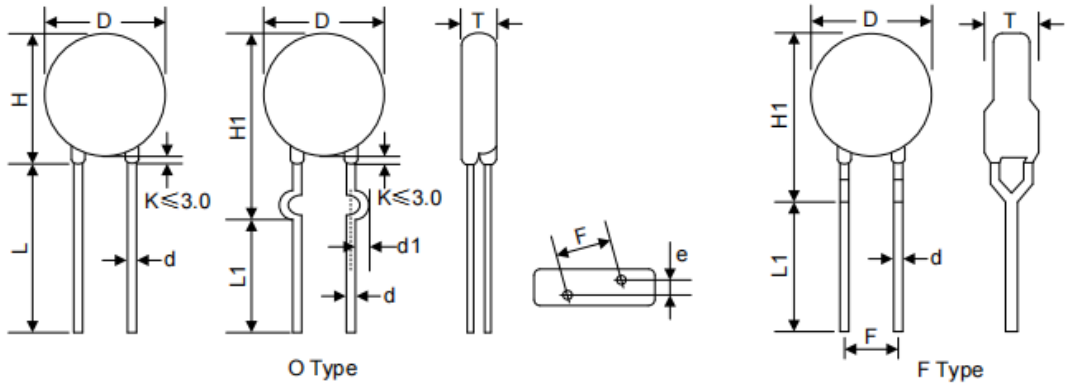


Table 1
Units: mm

Symbols	Dimensions
H(max.)	26.0
H1(max.)	28.0
L(min.)	20.0
L1(min.)	15.0
D(max.)	23.0
F	7.5±0.8/10.0±1.0
T(max.)	Table 2
e(±0.8)	Table 2
d(±0.05)	0.8/1.0
d1(±0.4)	1.4/1.6

Table 2
Units: mm

Model	T	e	Model	T	e
181K	4.6	2.1	391K	5.5	3.0
201K	4.7	2.2	431K	5.7	3.2
221K	4.8	2.3	471K	6.0	3.4
241K	4.9	2.4	511K	6.2	3.6
271K	5.0	2.6	561K	6.5	3.8
301K	5.0	2.7			
331K	5.2	2.7			
361K	5.4	2.9			

◆ KK/KK-J series

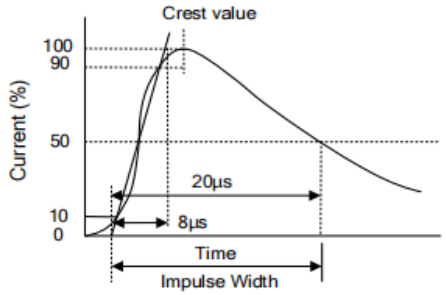
● Electrical Characteristics -20D KK/KK-J

Part Number		Maximum allowed voltage		Varistor Voltage	Maximum holding voltage		Able to withstand surges Current		Maximum energy (10/1000μs)		Rated power	Typical capacitors (Reference value)
Standard	High impact	VAC (V)	VDC (V)	V1mA (V)	IP (A)	VC (V)	I (A) Standard	Standard	High impact	VAC (V)	VDC (V)	V1mA (V)
181KK20	181KK20J	115	150	180(162~198)	100	300	6500	10000	85	130	1.0	2200
201KK20	201KK20J	130	170	200(180~220)	100	340	6500	10000	95	140	1.0	2000
221KK20	221KK20J	140	180	220(198~242)	100	360	6500	10000	100	155	1.0	1800
241KK20	241KK20J	150	200	240(216~264)	100	395	6500	10000	108	168	1.0	1650
271KK20	271KK20J	175	225	270(243~297)	100	455	6500	10000	127	190	1.0	1500
301KK20	301KK20J	190	250	300(270~330)	100	500	6500	10000	136	210	1.0	1300
331KK20	331KK20J	210	275	330(297~363)	100	550	6500	10000	150	228	1.0	1200
361KK20	361KK20J	130	300	360(324~396)	100	595	6500	10000	163	255	1.0	1100
391KK20	391KK20J	150	320	390(351~429)	100	650	6500	10000	180	275	1.0	1000
431KK20	431KK20J	175	350	430(387~473)	100	710	6500	10000	190	305	1.0	930
471KK20	471KK20J	300	385	470(423~517)	100	775	6500	10000	204	350	1.0	850
511KK20	511KK20J	320	415	510(459~561)	100	845	6500	10000	210	360	1.0	780
561KK20	561KK20J	350	460	560(504~616)	100	925	6500	10000	215	380	1.0	710

Note: Leakage current (applied 83% of nominal V1mA voltage): IR ≤ 25μA

◆ KK/KK-J series

● Electrical rated parameters

<table>
<tr><th>Experimental project</th><th>Experimental conditions/methods</th><th>Performance Requirements</th></tr>
<tr><td>Tensile strength</td><td>The voltage measured between the two terminals when a specified test DC current of 1mA is applied, is recorded as Vb。</td><td rowspan="8">Meet the specified requirements.</td></tr>
<tr><td>Bend resistance of the pin</td><td>The recommended maximum alternating current voltage (RMS) or maximum direct current voltage for sustainable application.</td></tr>
<tr><td>Maximum clamp voltage</td><td>The maximum voltage between the two pins under specified surge current conditions.
Pulse width: 8/20 microseconds
 
</td></tr>
<tr><td>Rated power consumption</td><td>The maximum average power that the device can withstand within the specified operating temperature range.</td></tr>
<tr><td>Maximum allowable energy</td><td>After applying a 10/1000us or 2ms pulse, the change in voltage should not exceed +10% Maximum allowable energy</td></tr>
<tr><td>Capable of withstanding surge currents</td><td>After applying a standard 8/20μs pulse current, the change in voltage should not exceed ±10% of the maximum current.</td></tr>
<tr><td rowspan="2">Maximum power consumption</td><td>$\left|\frac{V_{1mA@125℃}-V_{1mA@25℃}}{V_{1mA@25℃}}\times\frac{1}{100}\times 100\%(\%/℃)\right|$</td><td rowspan="2">≤0.05%/℃</td></tr>
<tr><td>$\left|\frac{V_{1mA@-40℃}-V_{1mA@25℃}}{V_{1mA@25℃}}\times\frac{1}{65}\times 100\%(\%/℃)\right|$</td></tr>
<tr><td>Wave endurance life</td><td>Under room temperature conditions, apply the specifed pulse sequence for 10,000 cycles, with a pulse interval of 10 seconds. After the test, measure the change in the resistance voltage, Vb.
<table>
<tr><td>7Φ Series</td><td>181K to 821K</td><td>50A (8/20μs)</td></tr>
<tr><td>10Φ Series</td><td>181K to 821K</td><td>100A (8/20μs)</td></tr>
<tr><td>14Φ Series</td><td>181K to 821K</td><td>150A (8/20μs)</td></tr>
<tr><td>20Φ Series</td><td>181K to 821K</td><td>200A (8/20μs)</td></tr>
</table></td><td>ΔVb/Vb ≤ ± 10%</td></tr>
</table>

◆ KK/KK-J series

● Mechanical Properties

Experimental project	Experimental conditions/methods	Performance Requirements
Curvature-derived strength	The specified load was applied gradually, and the device was kept stationary for a continuous period of 10± 1seconds。 Terminal diameter (mm) / Force (kg) 0.5<d≤0.8 / 1.0 0.8<d≤1.25 / 2.0 1.25<d / 4.0	No visible damage |ΔV1mA/V1mA |≤5%
Durability of bent pins	Secure the sample, applying the specified load to each pin; bend the pin.Return to the initial position after a 90° turn, then repeat the same turn in the opposite direction Terminal diameter (mm) / Force (kg) 0.5<d≤0.8 / 0.5 0.8<d≤1.25 / 1.0 1.25<d / 2.0	No visible damage |ΔV1mA/V1mA |≤5%
Vibration resistance	Frequency range: 10～55 Hz Amplitude：0.75 mm or acceleration of 98 m/s² Vibration direction: Three mutually perpendicular axes, each operating for 2 hours.	No visible damage |ΔV1mA/V1mA |≤5%
Solderability	Tin melting temperature: 245±5℃ Tinning time: 2±0.5 seconds	Tin coverage≧95%
High-temperature resistance for welding	Tin melting temperature: 260±5℃ Tinning time: 10±1 seconds	No visible damage |ΔV1mA/V1mA |≤ 10%

◆ KK/KK-J series

● Reliability

<table>
<tr><th>Experimental project</th><th>Experimental conditions/methods</th><th>Performance Requirements</th></tr>
<tr><td>High-temperature storage test</td><td>Ambient temperature: 125±2℃
Duration：1000 hours</td><td>ΔV1mA/V1mA |≤5%</td></tr>
<tr><td>Low-temperature storage test</td><td>Ambient temperature: -40±2℃
Duration：1000 hours</td><td>|ΔV1mA/V1mA |≤ 5%</td></tr>
<tr><td>Moisture resistance testing</td><td>Ambient temperature: 40±2℃，relative humidity 90～95% RH
Duration：1000 hours</td><td>|ΔV1mA/V1mA |≤ 5%</td></tr>
<tr><td>Temperature cycling test</td><td>The temperature variation is tested under the following conditions on the PCB: five cycles.
<table>
<tr><th>Steps</th><th>Temperature (°C)</th><th>Cycle (minutes)</th></tr>
<tr><td>1</td><td>-40±3</td><td>30±3</td></tr>
<tr><td>2</td><td>Room temperature</td><td>15±3</td></tr>
<tr><td>3</td><td>125±3</td><td>30±3</td></tr>
<tr><td>4</td><td>Room temperature</td><td>15±3</td></tr>
</table></td><td>No visible damage
|ΔV1mA/V1mA |≤ 5%</td></tr>
<tr><td>High-temperature load test</td><td>Ambient temperature: 125±2℃
Duration：1000 hours
Load condition: Maximum allowable continuous operating voltage under AC conditions.</td><td>ΔV1mA/V1mA|≤ 10%</td></tr>
<tr><td>Wet heat load test</td><td>Ambient temperature: 40±2℃，relative humidity 90～95% RH
Duration：1000 hours
Load: Maximum allowable continuous operating voltage</td><td>No visible damage
|ΔV1mA/V1mA |≤ 10%</td></tr>
<tr><td>Pressure test</td><td>Steel shot method (metal sphere electrode method), 2500 volts AC, with a continuous voltage of 1 Minute</td><td>No visible damage</td></tr>
</table>