

Metal Oxide Varistor (MOV) Data Sheet

Features

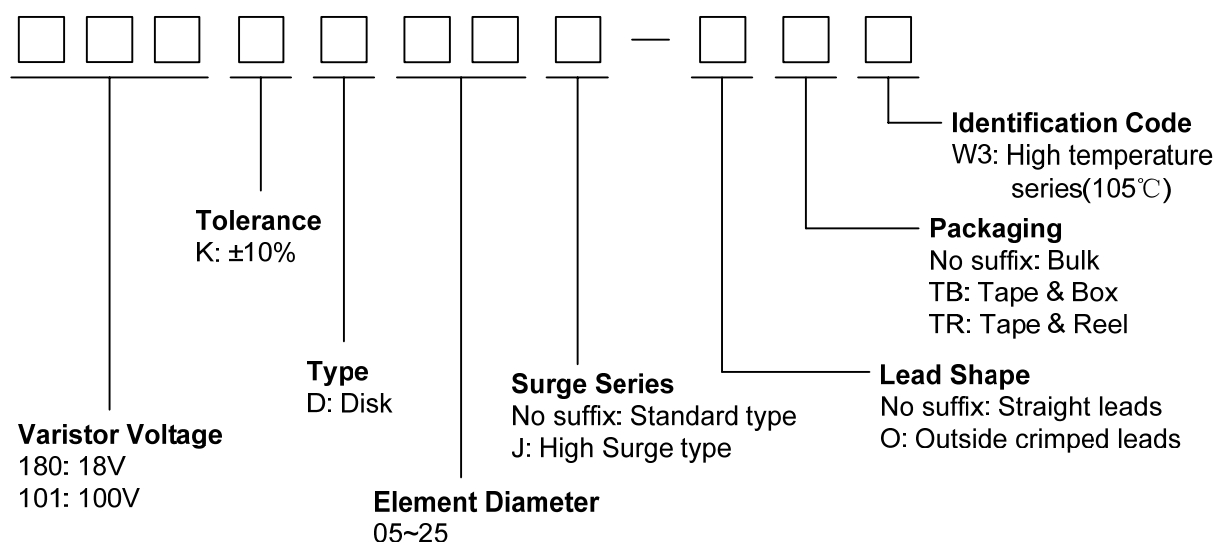
- Wide operating voltage (V_{1mA}) range from 18V to 750V
- Fast responding to transient over-voltage
- Large absorbing transient energy capability
- Low clamping ratio and no follow-on current
- Meets MSL level 1, per J-STD-020
- Operating Temperature: $-40^{\circ}\text{C} \sim +105^{\circ}\text{C}$
- Storage Temperature: $-40^{\circ}\text{C} \sim +125^{\circ}\text{C}$
- Safety certification: UL: E327997
CSA: 246579
VDE: 40027827



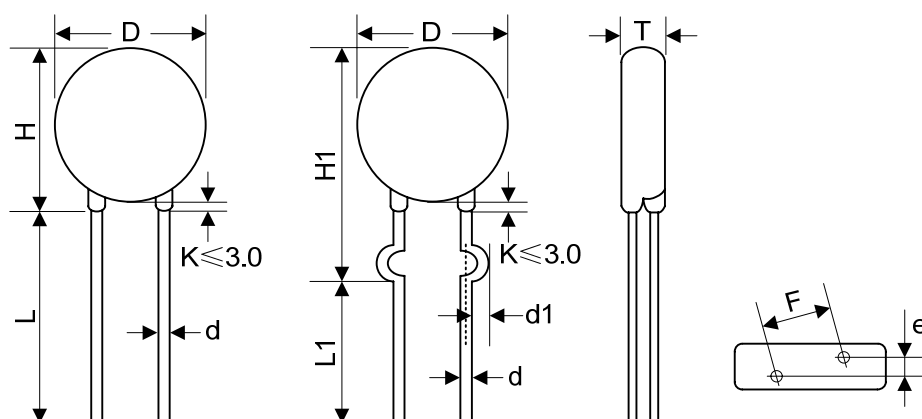
Applications

- Transistor, diode, IC, thyristor or triac semiconductor protection
- Surge protection in consumer electronics
- Surge protection in industrial electronics
- Surge protection in electronic home appliances, gas and petroleum appliances
- Relay and electromagnetic valve surge absorption

Part Number Code



Dimensions



O TYPE

Table 1

Unit: mm

Symbol	Dimension
H	5.5~10.0
H1	8.0~13.0
L(min.)	20.0
L1(min.)	15.0
D	5.0~7.5
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

Unit: mm

Model	T	e	Model	T	e
180K	1.5~4.5	1.3	221K	2.0~4.5	1.9
220K	1.6~4.6	1.4	241K	2.1~4.6	2.0
270K	1.6~4.7	1.6	271K	2.1~4.9	2.2
330K	1.7~4.9	1.5	301K	2.2~5.0	2.3
390K	1.6~4.8	1.6	331K	2.2~5.1	2.3
470K	1.7~4.9	1.7	361K	2.4~5.2	2.5
560K	1.8~5.0	1.9	391K	2.5~5.4	2.6
680K	1.9~5.2	2.2	431K	2.7~5.7	2.8
820K	1.6~4.1	1.6	471K	2.8~6.0	3.0
101K	1.9~4.3	1.8	511K	2.9~6.2	3.2
121K	1.9~4.5	2.0	561K	3.1~6.5	3.4
151K	1.7~4.8	1.6	621K	3.3~6.5	3.7
181K	1.8~4.3	1.7	681K	3.5~6.8	4.0
201K	1.9~4.4	1.8	751K	3.8~6.9	4.1

Electrical Characteristics

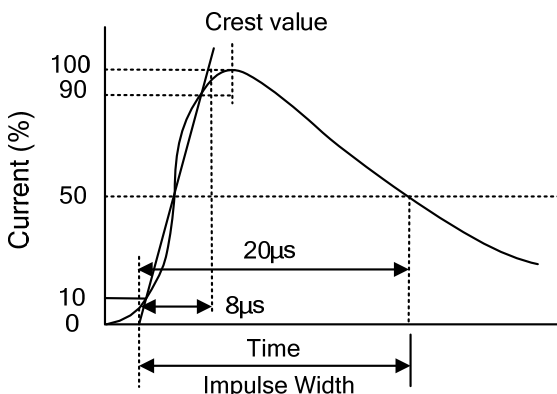
Part Number		Maximum Allowable Voltage		Varistor Voltage	Maximum Clamping Voltage		Withstanding Surge Current		Maximum Energy (10/1000μs)		Rated Power	Typical Capacitance (Reference)
Standard	High Surge	V _{AC} (V)	V _{DC} (V)	V _{1mA} (V)	I _P (A)	V _C (V)	I (A) Standard	I (A) High Surge	(J) Standard	(J) High Surge	(W)	@1KHz (pf)
180KD05-W3	180KD05J-W3	11	14	15~21.6	1	40	100	250	0.4	0.6	0.01	1400
220KD05-W3	220KD05J-W3	14	18	19.5~26	1	48	100	250	0.5	0.7	0.01	1150
270KD05-W3	270KD05J-W3	17	22	24~31	1	60	100	250	0.6	0.9	0.01	930
330KD05-W3	330KD05J-W3	20	26	29.5~36.5	1	73	100	250	0.8	1.1	0.01	760
390KD05-W3	390KD05J-W3	25	31	35~43	1	80	100	250	0.9	1.2	0.01	640
470KD05-W3	470KD05J-W3	30	38	42~52	1	104	100	250	1.1	1.5	0.01	530
560KD05-W3	560KD05J-W3	35	45	50~62	1	123	100	250	1.3	1.8	0.01	450
680KD05-W3	680KD05J-W3	40	56	61~75	1	145	100	250	1.6	2.2	0.01	370
820KD05-W3	820KD05J-W3	50	65	74~90	5	150	400	800	2.5	4.0	0.1	300
101KD05-W3	101KD05J-W3	60	85	90~110	5	177	400	800	3.0	4.1	0.1	250
121KD05-W3	121KD05J-W3	75	100	108~132	5	210	400	800	4.0	4.9	0.1	210
151KD05-W3	151KD05J-W3	95	125	135~165	5	260	400	800	4.1	6.5	0.1	165
181KD05-W3	181KD05J-W3	115	150	162~198	5	320	400	800	4.9	7.5	0.1	140
201KD05-W3	201KD05J-W3	130	170	180~220	5	355	400	800	6.5	8.5	0.1	125
221KD05-W3	221KD05J-W3	140	180	198~242	5	380	400	800	7.5	9.0	0.1	110
241KD05-W3	241KD05J-W3	150	200	216~264	5	415	400	800	8.0	10.5	0.1	100
271KD05-W3	271KD05J-W3	175	225	243~297	5	475	400	800	8.5	11.0	0.1	95
301KD05-W3	301KD05J-W3	190	250	270~330	5	520	400	800	9.0	12.0	0.1	85
331KD05-W3	331KD05J-W3	210	275	297~363	5	570	400	800	9.5	13.0	0.1	75
361KD05-W3	361KD05J-W3	230	300	324~396	5	620	400	800	10.0	16.0	0.1	70
391KD05-W3	391KD05J-W3	250	320	351~429	5	675	400	800	12.0	17.0	0.1	65
431KD05-W3	431KD05J-W3	275	350	387~473	5	745	400	800	13.0	20.0	0.1	60
471KD05-W3	471KD05J-W3	300	385	423~517	5	810	400	800	15.0	21.0	0.1	55
511KD05-W3	511KD05J-W3	320	415	459~561	5	845	400	800	16.0	22.5	0.1	50
561KD05-W3	561KD05J-W3	350	460	504~616	5	920	400	800	16.8	24.0	0.1	45
621KD05-W3	621KD05J-W3	385	505	558~682	5	1025	400	800	17.7	25	0.1	40
681KD05-W3	681KD05J-W3	420	560	612~748	5	1120	400	800	21	29	0.1	35
751KD05-W3	751KD05J-W3	460	615	675~825	5	1240	400	800	22.4	32.0	0.1	30

Notes: 1. The tolerance of varistor voltage between 18V and 27V is more than 10%.

2. Leakage Current (@83% of V_{1mA}): IR≤50μA (180K~680K)

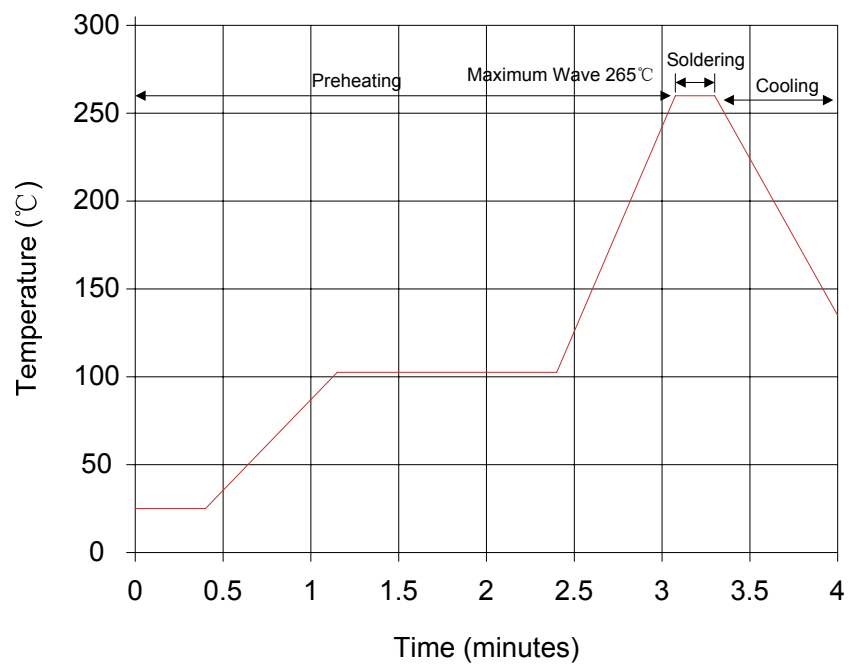
IR≤25μA (820K~751K)

Electrical Ratings

Items	Test Condition/Description	Requirement					
Varistor Voltage	The voltage between two terminals with the specified measuring current 1mA.DC applied is called Vb.	To meet the Specified value					
Maximum Allowable Voltage	The recommended maximum sine wave voltage (RMS) or the Maximum DC voltage can be applied continuously.						
Maximum Clamping Voltage	The maximum voltage between two terminals with the specification standard impulse current. Applied waveform: 8/20μs 						
Rated Wattage	The maximum average power that can be applied within the specified ambient temperature.						
Energy	The maximum energy within the varistor voltage change of ±10% when one impulse of 10/1000μs or 2ms is applied.						
Withstanding Surge Current	The maximum current within the varistor voltage change of ±10% with the standard impulse current (8/20μs) applied one time.						
Varistor Voltage Temp. Coefficient	$\left \frac{V_{1mA@105^{\circ}C} - V_{1mA@25^{\circ}C}}{V_{1mA@25^{\circ}C}} \times \frac{1}{80} \times 100\% (/^{\circ}C) \right $ $\left \frac{V_{1mA@-40^{\circ}C} - V_{1mA@25^{\circ}C}}{V_{1mA@25^{\circ}C}} \times \frac{1}{65} \times 100\% (/^{\circ}C) \right $	≤0.05%/°C					
Surge Life	The change of Vb shall be measured after the impulse listed below which is applied 10,000 times continuously with the interval of ten seconds at room temperature. <table border="1" data-bbox="438 1892 1204 2027"> <tr> <td rowspan="2">5Φ series</td><td>180K to 680K</td><td>10A (8/20μs)</td></tr> <tr> <td>820K to 751K</td><td>20A (8/20μs)</td></tr> </table>	5Φ series	180K to 680K	10A (8/20μs)	820K to 751K	20A (8/20μs)	$\frac{\Delta V_b}{V_b} \leq \pm 10\%$
5Φ series	180K to 680K		10A (8/20μs)				
	820K to 751K	20A (8/20μs)					

Soldering Recommendation

Wave Lead Free Soldering Recommendation



Item	Conditions
Peak Temperature	265°C
Dipping Time	10 seconds (max.)
Soldering	1 time

Recommendation Reworking Conditions with Soldering Iron

Item	Conditions
Temperature of Soldering Iron-tip	360°C (max.)
Soldering Time	3 seconds (max.)
Distance from Varistor	2mm (min.)

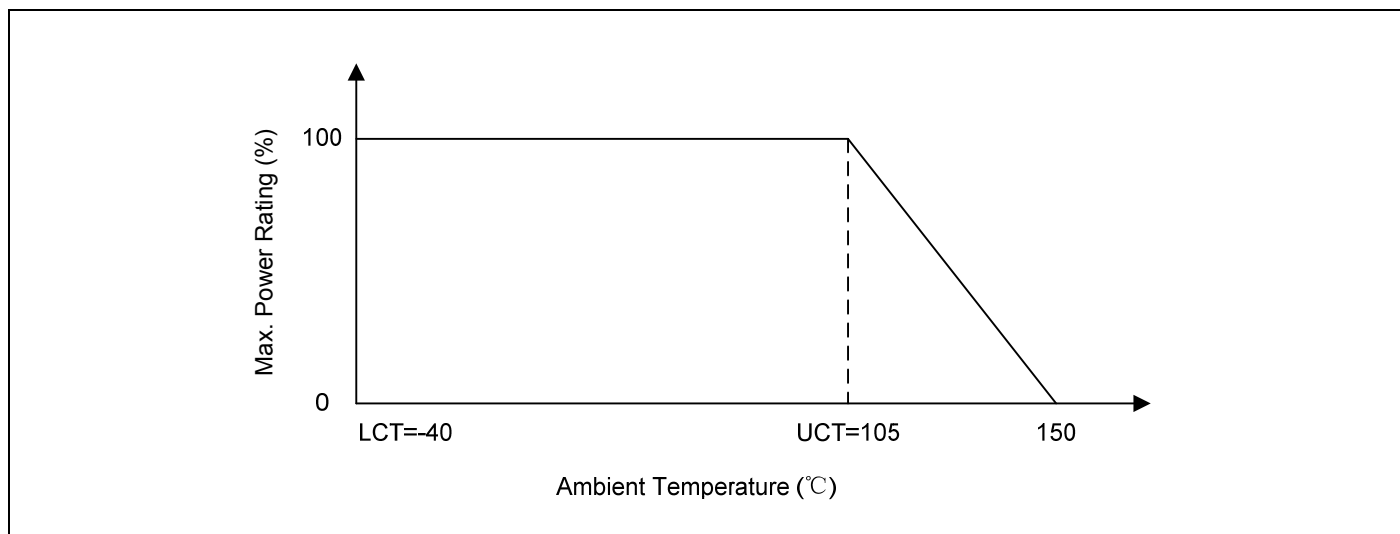
Mechanical Characteristics

Items	Test conditions / Methods	Specifications								
Tensile Strength of Terminals	Gradually applying the force specified and keeping the unit fixed for 10±1 sec. <table><tr><td><u>Terminal diameter (mm)</u></td><td><u>Force (kg)</u></td></tr><tr><td>0.5<d≤0.8</td><td>1.0</td></tr><tr><td>0.8<d≤1.25</td><td>2.0</td></tr><tr><td>1.25<d</td><td>4.0</td></tr></table>	<u>Terminal diameter (mm)</u>	<u>Force (kg)</u>	0.5<d≤0.8	1.0	0.8<d≤1.25	2.0	1.25<d	4.0	No visible damage ΔV _{1mA} /V _{1mA} ≤5%
<u>Terminal diameter (mm)</u>	<u>Force (kg)</u>									
0.5<d≤0.8	1.0									
0.8<d≤1.25	2.0									
1.25<d	4.0									
Bending Strength of Terminals	Hold specimen and apply the force specified below to each lead. Bend the specimen to 90°, then return to the original position. Repeat the procedure in the opposite direction. <table><tr><td><u>Terminal diameter (mm)</u></td><td><u>Force (kg)</u></td></tr><tr><td>0.5<d≤0.8</td><td>0.5</td></tr><tr><td>0.8<d≤1.25</td><td>1.0</td></tr><tr><td>1.25<d</td><td>2.0</td></tr></table>	<u>Terminal diameter (mm)</u>	<u>Force (kg)</u>	0.5<d≤0.8	0.5	0.8<d≤1.25	1.0	1.25<d	2.0	No visible damage ΔV _{1mA} /V _{1mA} ≤5%
<u>Terminal diameter (mm)</u>	<u>Force (kg)</u>									
0.5<d≤0.8	0.5									
0.8<d≤1.25	1.0									
1.25<d	2.0									
Vibration	Frequency range: 10~55 Hz Amplitude: 0.75mm or 98m/s ² Direction: 3 mutually perpendicular directions, 2hrs each.	No visible damage ΔV _{1mA} /V _{1mA} ≤5%								
Solder ability	Solder Temp: 245±5℃ Dipping Time: 2±0.5 sec	At least 95% of terminal electrode is covered by new solder								
Resistance to Soldering Heat	Solder Temp: 260±5℃ Dipping Time: 10±1 sec	No visible damage ΔV _{1mA} /V _{1mA} ≤10%								

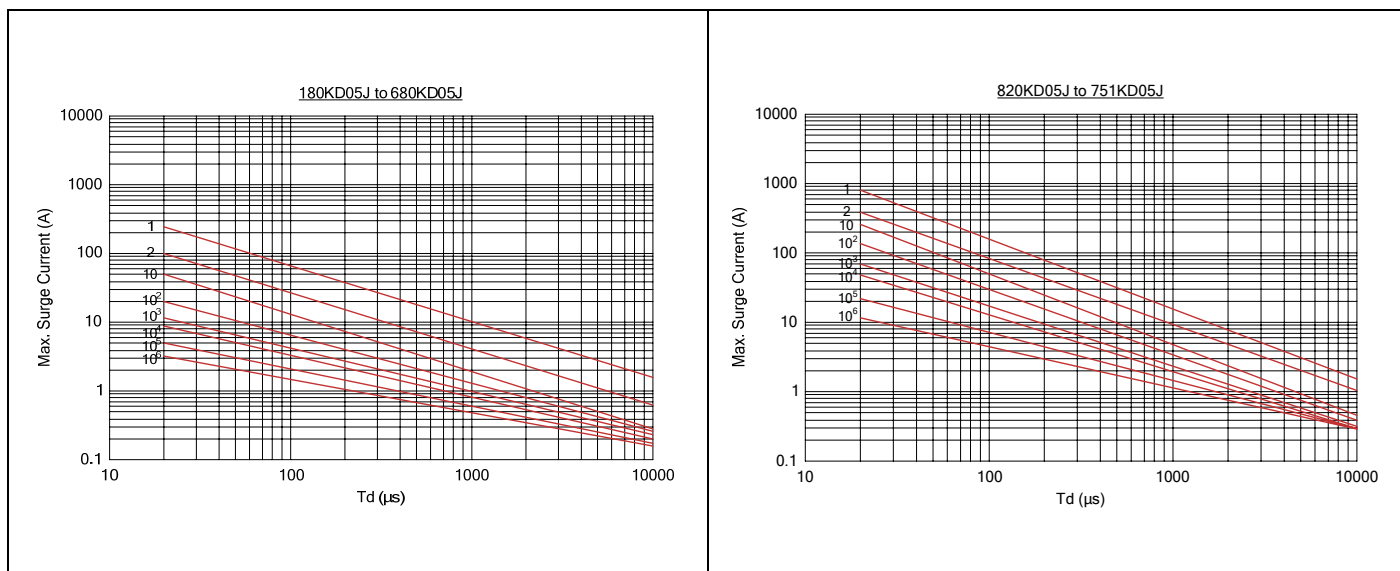
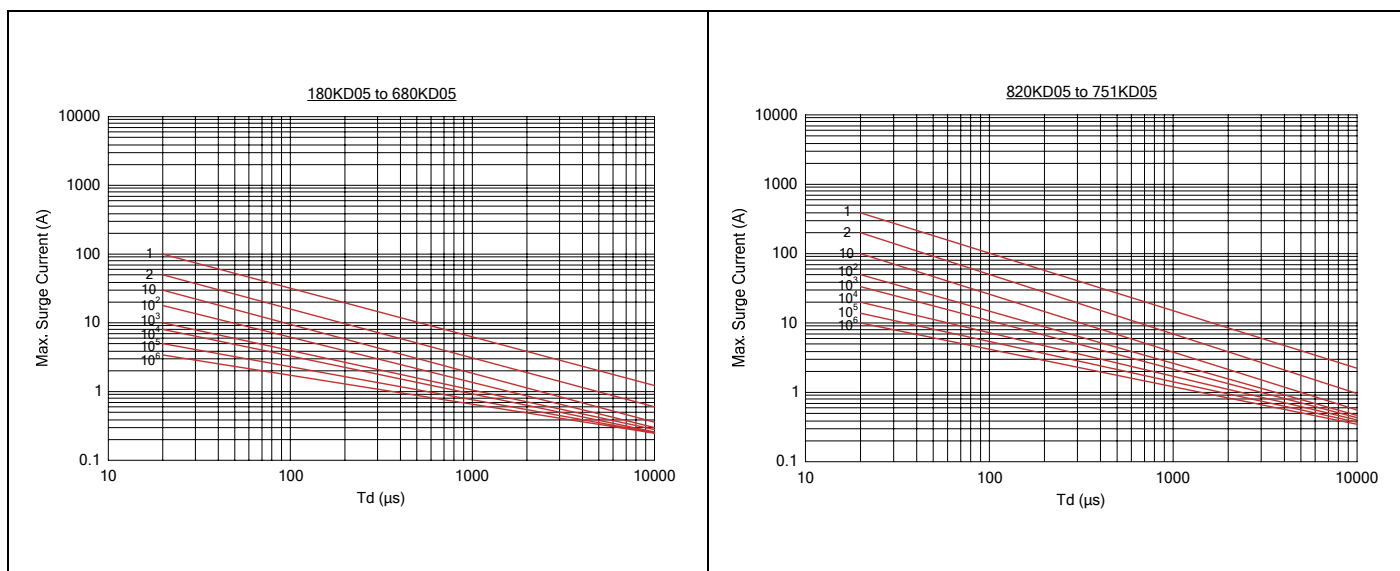
Reliability

Items	Test conditions / Methods	Specifications															
High Temperature Storage	Ambient Temp: 125±2℃ Duration: 1000hrs	ΔV _{1mA} /V _{1mA} ≤5%															
Low Temperature Storage	Ambient Temp: -40±2℃ Duration: 1000hrs	ΔV _{1mA} /V _{1mA} ≤5%															
Humidity	Ambient Temp: 40±2℃, 90~95% R.H. Duration: 1000hrs	ΔV _{1mA} /V _{1mA} ≤5%															
Temperature Cycle	The conditions shown below shall be repeated 5 cycles <table> <tr> <th>Step</th><th>Temperature (℃)</th><th>Period (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>	Step	Temperature (℃)	Period (minutes)	1	-40±3	30±3	2	Room temperature	15±3	3	125±3	30±3	4	Room temperature	15±3	No visible damage ΔV _{1mA} /V _{1mA} ≤5%
Step	Temperature (℃)	Period (minutes)															
1	-40±3	30±3															
2	Room temperature	15±3															
3	125±3	30±3															
4	Room temperature	15±3															
High Temperature Load	Ambient Temp: 105±2℃ Duration: 1000hrs Load: Max. Allowable Voltage In AC eara.	ΔV _{1mA} /V _{1mA} ≤10%															
Damp Heat Load	Ambient Temp: 40±2℃, 90~95% R.H. Duration: 1000hrs Load: Max. Allowable Voltage	No visible damage ΔV _{1mA} /V _{1mA} ≤10%															
Voltage Proof	Metal balls method, 2500Vac 1 min.	No visible damage															

Power Derating Curve

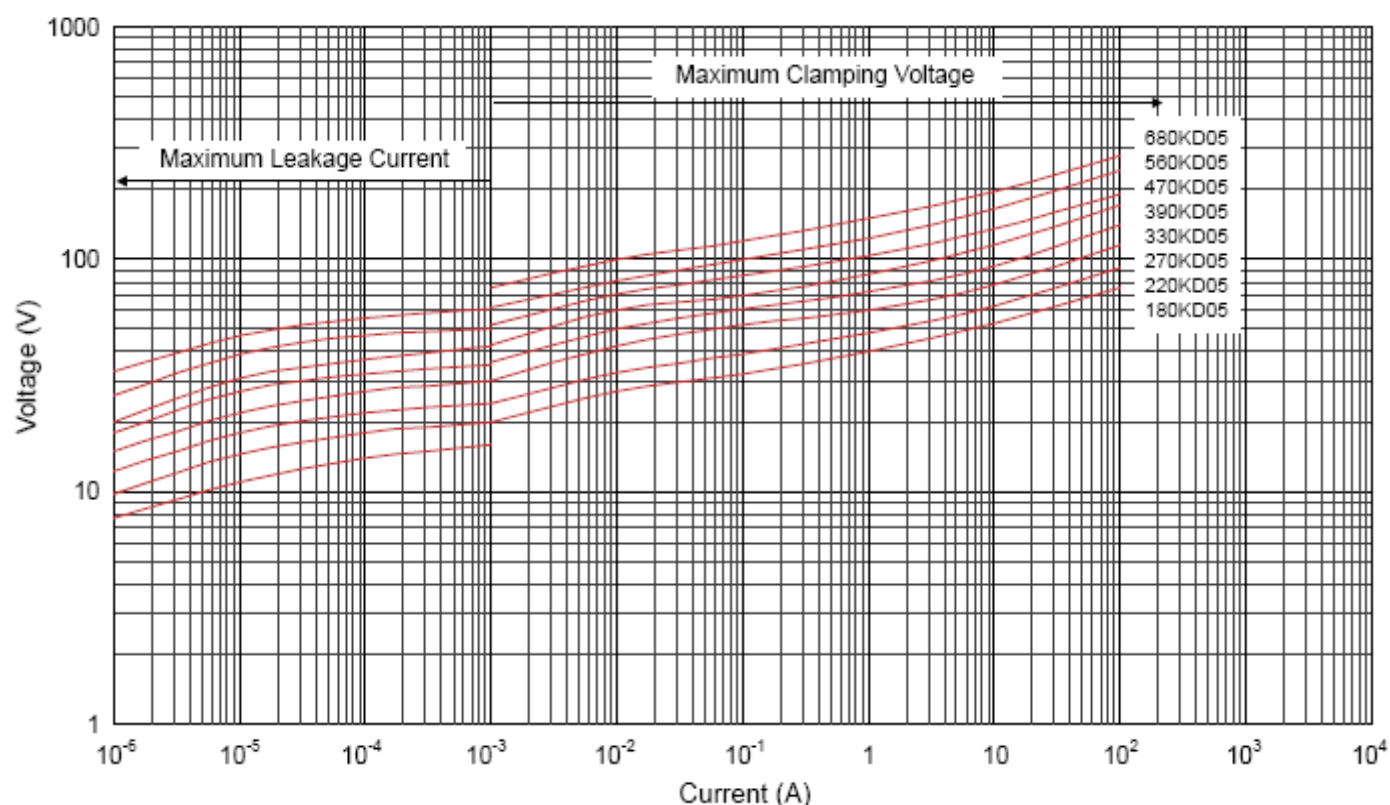


Maximum Surge Current Derating Curve

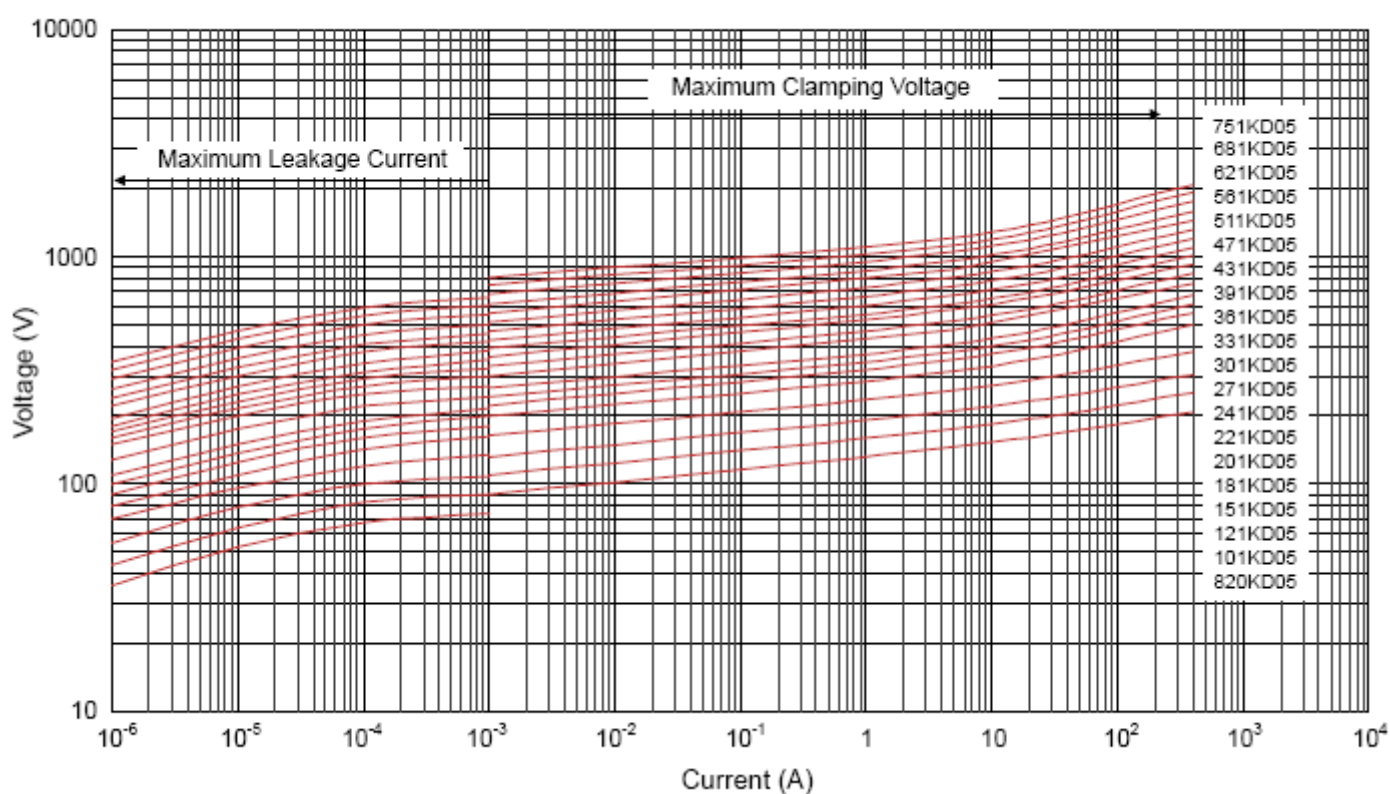


Maximum Leakage Current and Maximum Clamping Voltage Curve

180KD05 to 680KD05

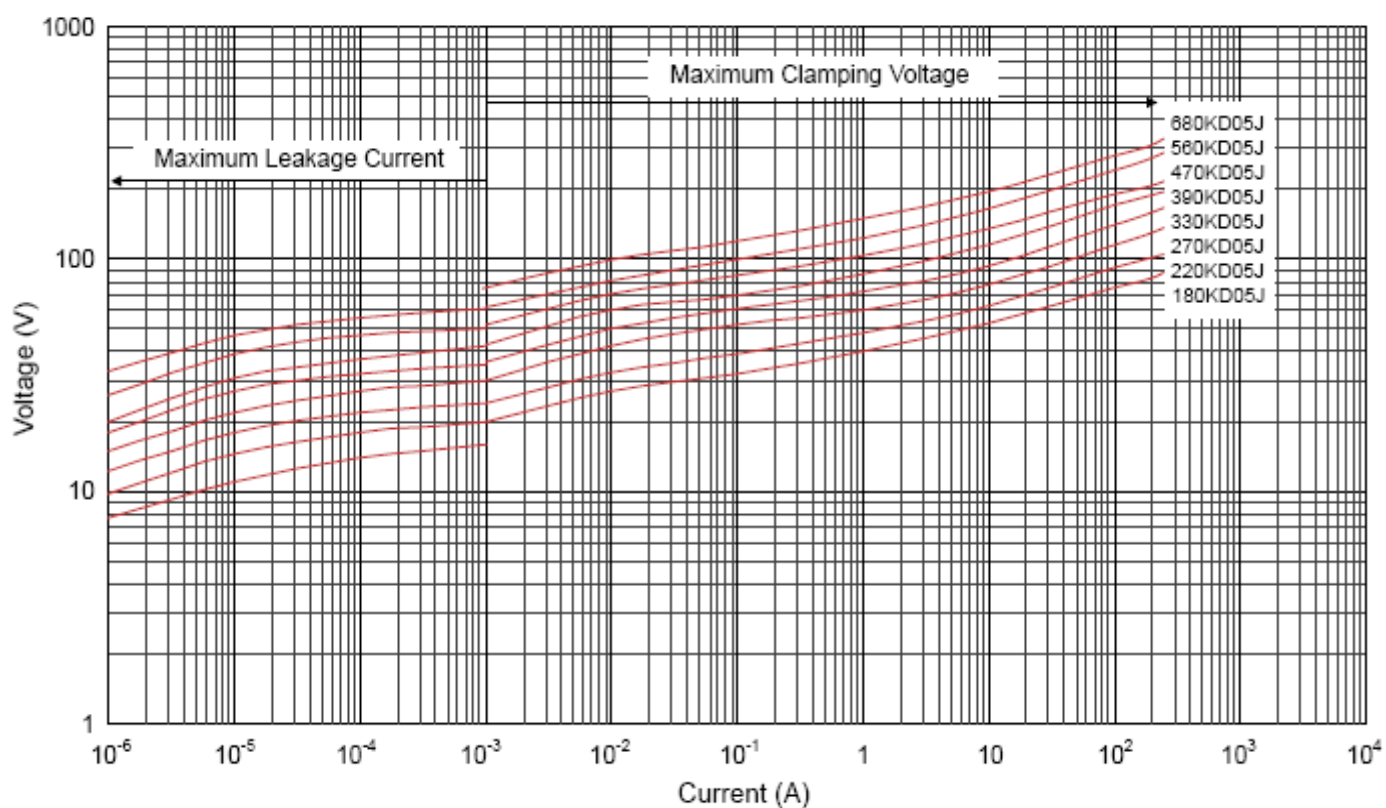


820KD05 to 751KD05

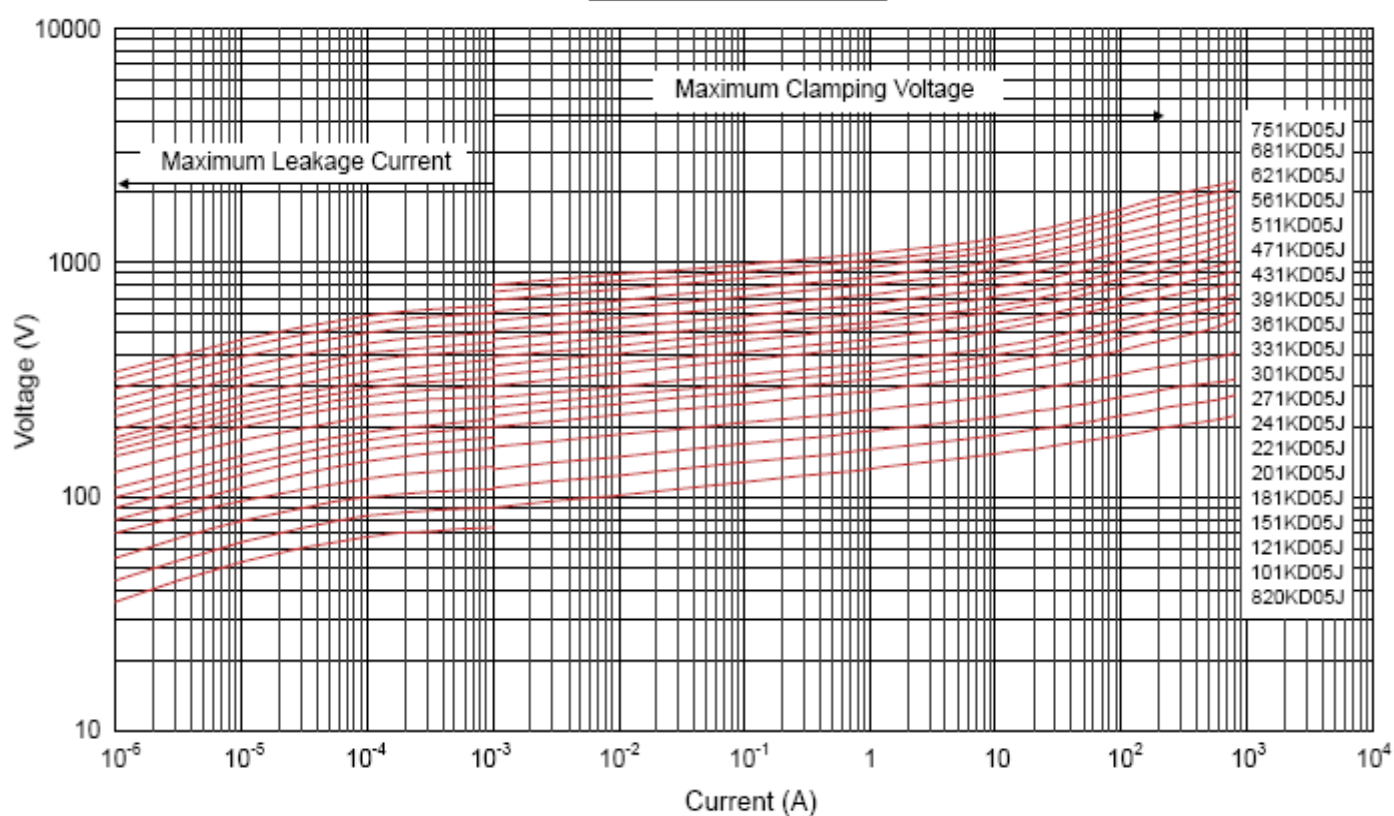


Maximum Leakage Current and Maximum Clamping Voltage Curve

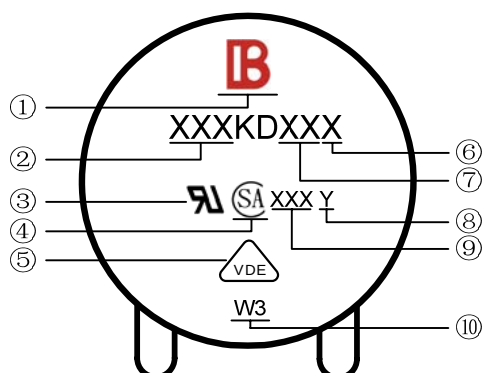
180KD05J to 680KD05J



820KD05J to 751KD05J

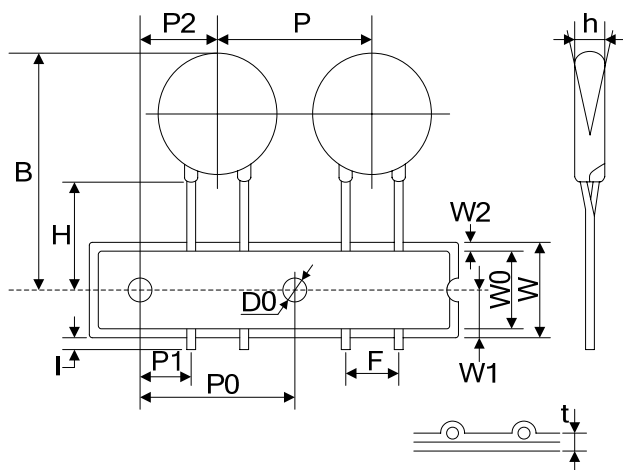


Marking Code



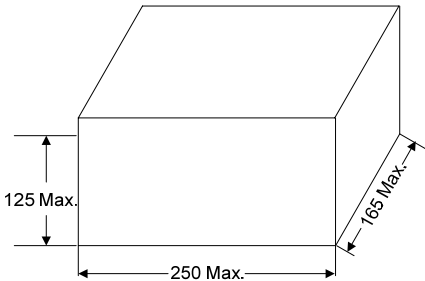
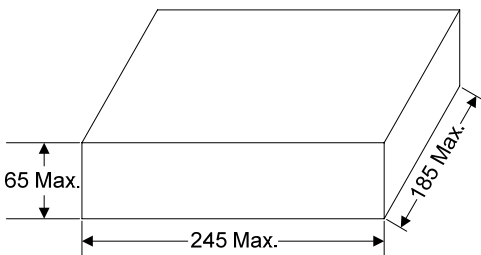
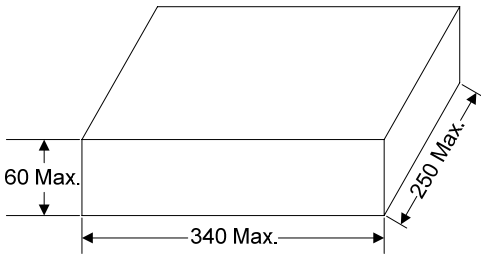
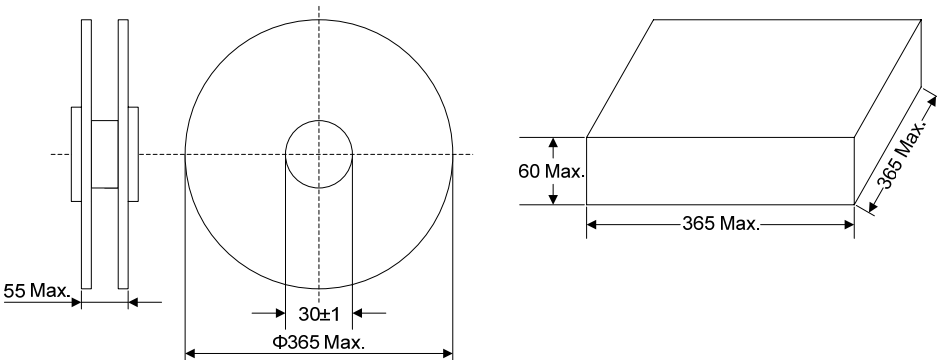
- ① Brightking Logo
- ② Varistor Voltage
- ③ UL Accreditation Logo
- ④ CSA Accreditation Logo
- ⑤ VDE Accreditation Logo
- ⑥ “J” is High Surge Code, no “J” is Standard Surge
- ⑦ Disk Size
- ⑧ Product Line Code (“Y” may be A(a) thru Z(z))
- ⑨ Date Code
- ⑩ High Temperature Code (105°C)

Taping Dimensions



Symbol	Dimension (mm)
P	12.7±1.0
P0	12.7±0.3
P1	3.85±0.7
P2	6.35±1.3
F	5.0±0.8
h	0±2
W	18.0±1.0
W0	12.0±1.0
W1	9.0±0.5
W2	3.0max
H	20.0±2.0
I	1.0max
D0	4.0±0.2
t	0.6±0.3
B	32max

Quantity

Packaging Dimensions (Unit: mm)	Quantity
Exposure in bulk 	1000pcs/bag 4bags/box
Cut the feet in bulk 	1000pcs/bag 4bags/box
Tape & Box 	1500pcs/box (180K~391K)
	1000pcs/box (431K~751K)
Tape & Reel 	2000pcs/reel (180K~391K)
	1500pcs/reel (431K~751K)