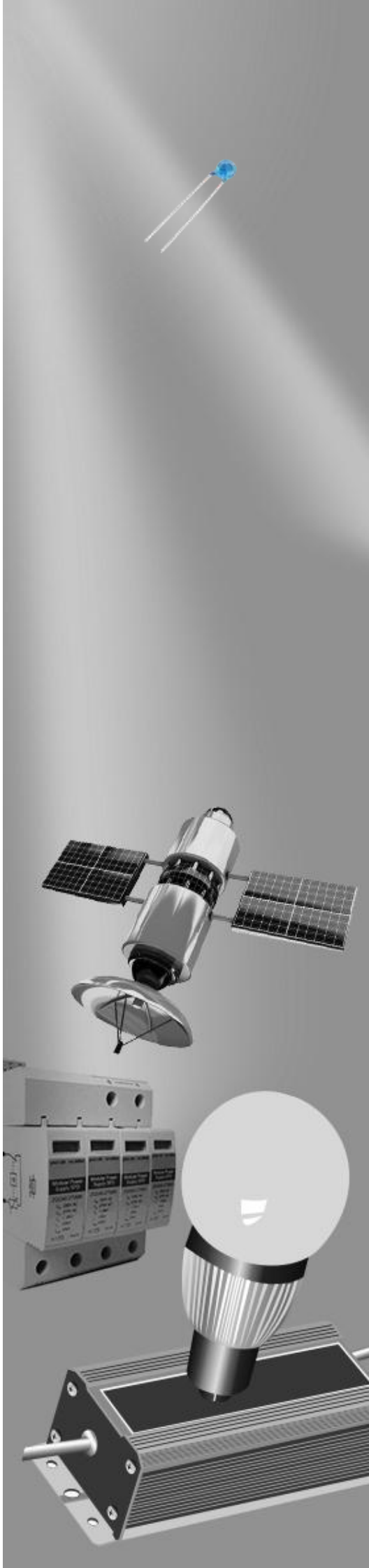
Innovative Service Around the Globe YAGEO

DATA SHEET

METAL OXIDE VARISTORS
POWER SUPPLY

05D series

RoHS compliant & Halogen free



Product specification– January 09, 2019 V.0

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℃ ~ +105℃
- Storage Temperature：-40℃ ~ +125℃
- 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

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Varistor Voltage
180: 18V
101: 100V
102: 1000V

Tolerance
K: ±10%

Type
D: Disk

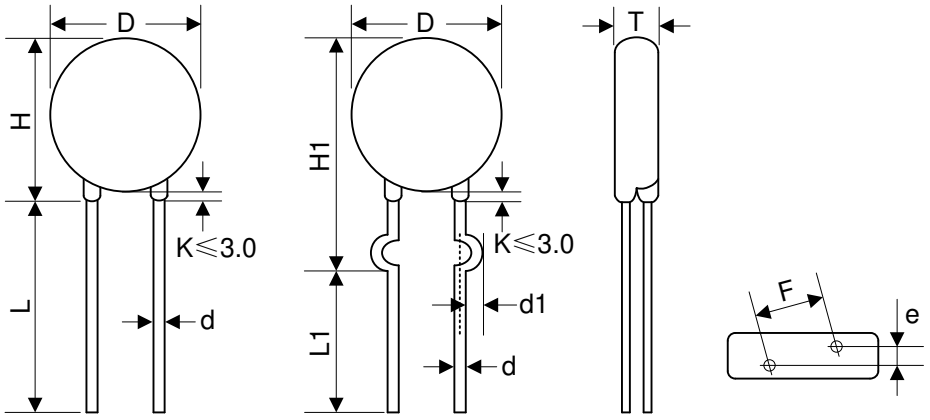
Element Diameter
05~53

Surge Series
No suffix: Standard type
J: High Surge type

Lead Shape
No suffix: Straight leads
O: Outside crimped leads

Packing
No suffix: Bulk
TB: Tape & Box
TR: Tape & Reel

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

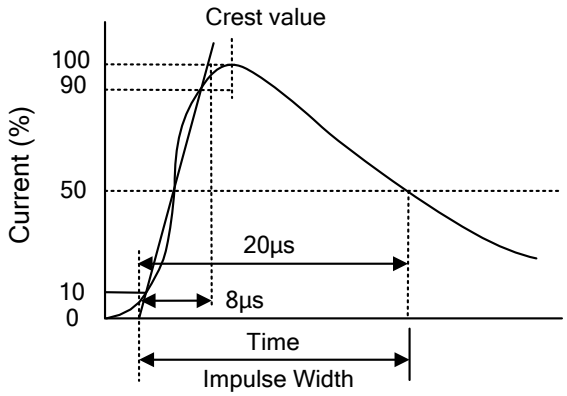
Part Number		Maximum Allowable Voltage		Varistor Voltage	Maximum Clamping Voltage		Withstanding Surge Current		Maximum Energy (10/1000μs)		Rated Power	Typical Capacitance (Reference)
Standard	High Surge	V_{AC}(V)	V_{DC}(V)	V_{1mA}(V)	I_P(A)	V_C(V)	I (A) Standard	I (A) High Surge	(J) Standard	(J) High Surge	(W)	@1KHz (pf)
180KD05	180KD05J	11	14	18(15~21.6)	1	40	100	250	0.4	0.6	0.01	1400
220KD05	220KD05J	14	18	22(19.5~26)	1	48	100	250	0.5	0.7	0.01	1150
270KD05	270KD05J	17	22	27(24~31)	1	60	100	250	0.6	0.9	0.01	930
330KD05	330KD05J	20	26	33(29.5~36.5)	1	73	100	250	0.8	1.1	0.01	760
390KD05	390KD05J	25	31	39(35~43)	1	80	100	250	0.9	1.2	0.01	640
470KD05	470KD05J	30	38	47(42~52)	1	104	100	250	1.1	1.5	0.01	530
560KD05	560KD05J	35	45	56(50~62)	1	123	100	250	1.3	1.8	0.01	450
680KD05	680KD05J	40	56	68(61~75)	1	145	100	250	1.6	2.2	0.01	370
820KD05	820KD05J	50	65	82(74~90)	5	150	400	800	2.5	4.0	0.1	300
101KD05	101KD05J	60	85	100(90~110)	5	177	400	800	3.0	4.1	0.1	250
121KD05	121KD05J	75	100	120(108~132)	5	210	400	800	4.0	4.9	0.1	210
151KD05	151KD05J	95	125	150(135~165)	5	260	400	800	4.1	6.5	0.1	165
181KD05	181KD05J	115	150	180(162~198)	5	320	400	800	4.9	7.5	0.1	140
201KD05	201KD05J	130	170	200(180~220)	5	355	400	800	6.5	8.5	0.1	125
221KD05	221KD05J	140	180	220(198~242)	5	380	400	800	7.5	9.0	0.1	110
241KD05	241KD05J	150	200	240(216~264)	5	415	400	800	8.0	10.5	0.1	100
271KD05	271KD05J	175	225	270(243~297)	5	475	400	800	8.5	11.0	0.1	95
301KD05	301KD05J	190	250	300(270~330)	5	520	400	800	9.0	12.0	0.1	85
331KD05	331KD05J	210	275	330(297~363)	5	570	400	800	9.5	13.0	0.1	75
361KD05	361KD05J	230	300	360(324~396)	5	620	400	800	10.0	16.0	0.1	70
391KD05	391KD05J	250	320	390(351~429)	5	675	400	800	12.0	17.0	0.1	65
431KD05	431KD05J	275	350	430(387~473)	5	745	400	800	13.0	20.0	0.1	60
471KD05	471KD05J	300	385	470(423~517)	5	810	400	800	15.0	21.0	0.1	55
511KD05	511KD05J	320	415	510(459~561)	5	845	400	800	16.0	22.5	0.1	50
561KD05	561KD05J	350	460	560(504~616)	5	920	400	800	16.8	24.0	0.1	45
621KD05	621KD05J	385	505	620(558~682)	5	1025	400	800	17.7	25.0	0.1	40
681KD05	681KD05J	420	560	680(612~748)	5	1120	400	800	21.0	29.0	0.1	35
751KD05	751KD05J	460	615	750(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)

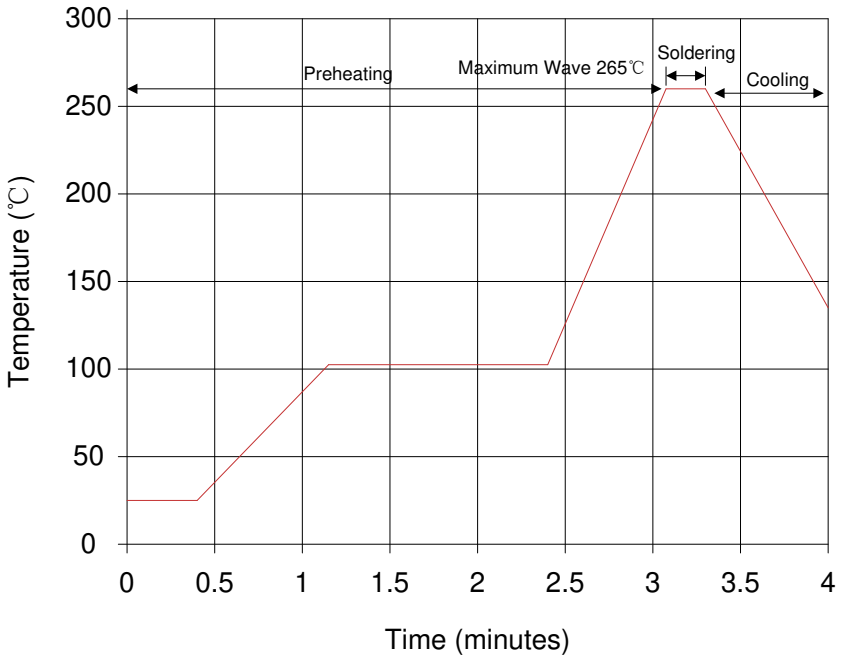
IR≤25μA (820K~751K)

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	$\left\lvert \frac{V_{1mA@85℃}-V_{1mA@25℃}}{V_{1mA@25℃}} \times \frac{1}{60} \times 100\%(\%/℃) \right\rvert$ $\left\lvert \frac{V_{1mA@-40℃}-V_{1mA@25℃}}{V_{1mA@25℃}} \times \frac{1}{65} \times 100\%(\%/℃) \right\rvert$	≤0.05%/℃
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. 5Φ series: 180K to 680K — 10A (8/20μs); 820K to 751K — 20A (8/20μs)	$\frac{\Delta Vb}{Vb} \leq \pm 10\%$

Soldering Recommendation

Wave Lead Free Soldering Recommendation



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

Recommendation Reworking Conditions with Soldering Iron

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

Mechanical Characteristics

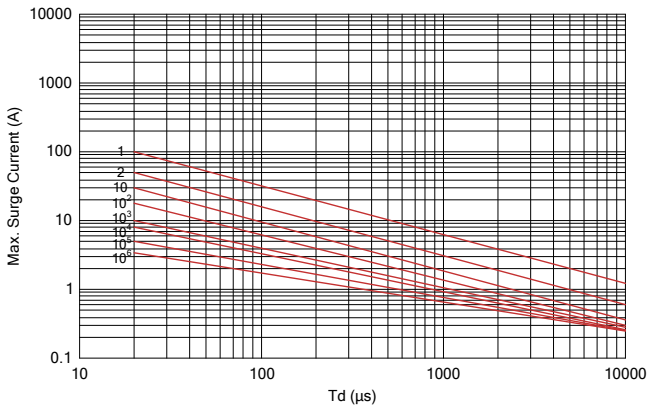
Items	Test conditions / Methods	Specifications
Tensile Strength of Terminals	Gradually applying the force specified and keeping the unit fixed for 10±1 sec. Terminal diameter (mm) / Force (kg) 0.5＜d≤0.8 / 1.0 0.8＜d≤1.25 / 2.0 1.25＜d / 4.0	No visible damage $\lvert\Delta V_{1mA}/V_{1mA}\rvert \leq 5\%$
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. 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 $\lvert\Delta V_{1mA}/V_{1mA}\rvert \leq 5\%$
Vibration	Frequency range: 10~55 Hz Amplitude: 0.75mm or 98m/s^2 Direction: 3 mutually perpendicular directions, 2hrs each.	No visible damage $\lvert\Delta V_{1mA}/V_{1mA}\rvert \leq 5\%$
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 $\lvert\Delta V_{1mA}/V_{1mA}\rvert \leq 10\%$

Reliability

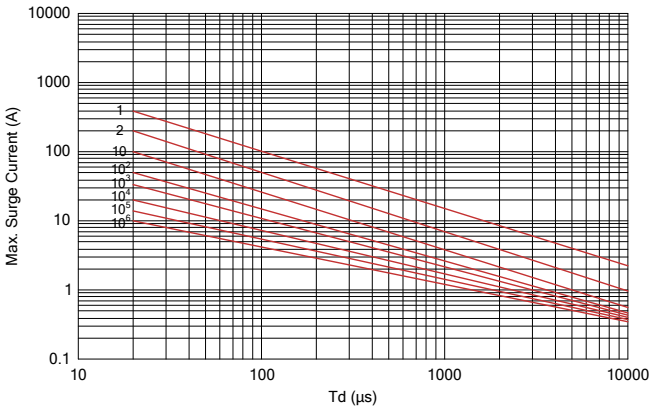
Items	Test conditions / Methods	Specifications
High Temperature Storage	Ambient Temp: 125±2℃ Duration: 1000hrs	$\lvert\Delta V_{1mA}/V_{1mA}\rvert \leq 5\%$
Low Temperature Storage	Ambient Temp: -40±2℃ Duration: 1000hrs	$\lvert\Delta V_{1mA}/V_{1mA}\rvert \leq 5\%$
Humidity	Ambient Temp: 40±2℃, 90~95% R.H. Duration: 1000hrs	$\lvert\Delta V_{1mA}/V_{1mA}\rvert \leq 5\%$
Temperature Cycle	The conditions shown below shall be repeated 5 cycles 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 $\lvert\Delta V_{1mA}/V_{1mA}\rvert \leq 5\%$
High Temperature Load	Ambient Temp: 105±2℃ Duration: 1000hrs Load: Max. Allowable Voltage In AC eara.	$\lvert\Delta V_{1mA}/V_{1mA}\rvert \leq 10\%$
Damp Heat Load	Ambient Temp: 40±2℃, 90~95% R.H. Duration: 1000hrs Load: Max. Allowable Voltage.	No visible damage $\lvert\Delta V_{1mA}/V_{1mA}\rvert \leq 10\%$
Voltage Proof	Metal balls method, 2500Vac 1 min.	No visible damage

Maximum Surge Current Derating Curve

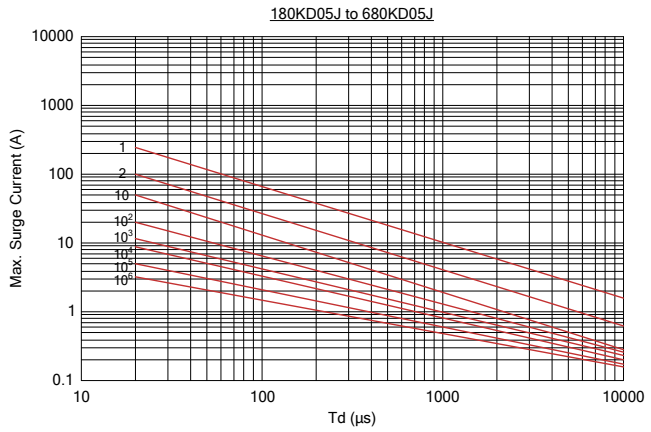
180KD05 to 680KD05



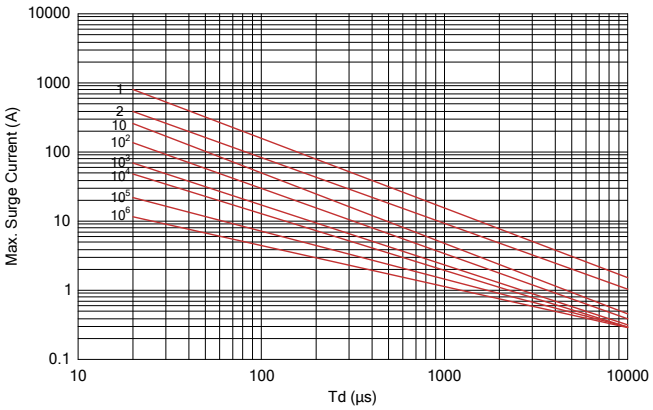
820KD05 to 751KD05



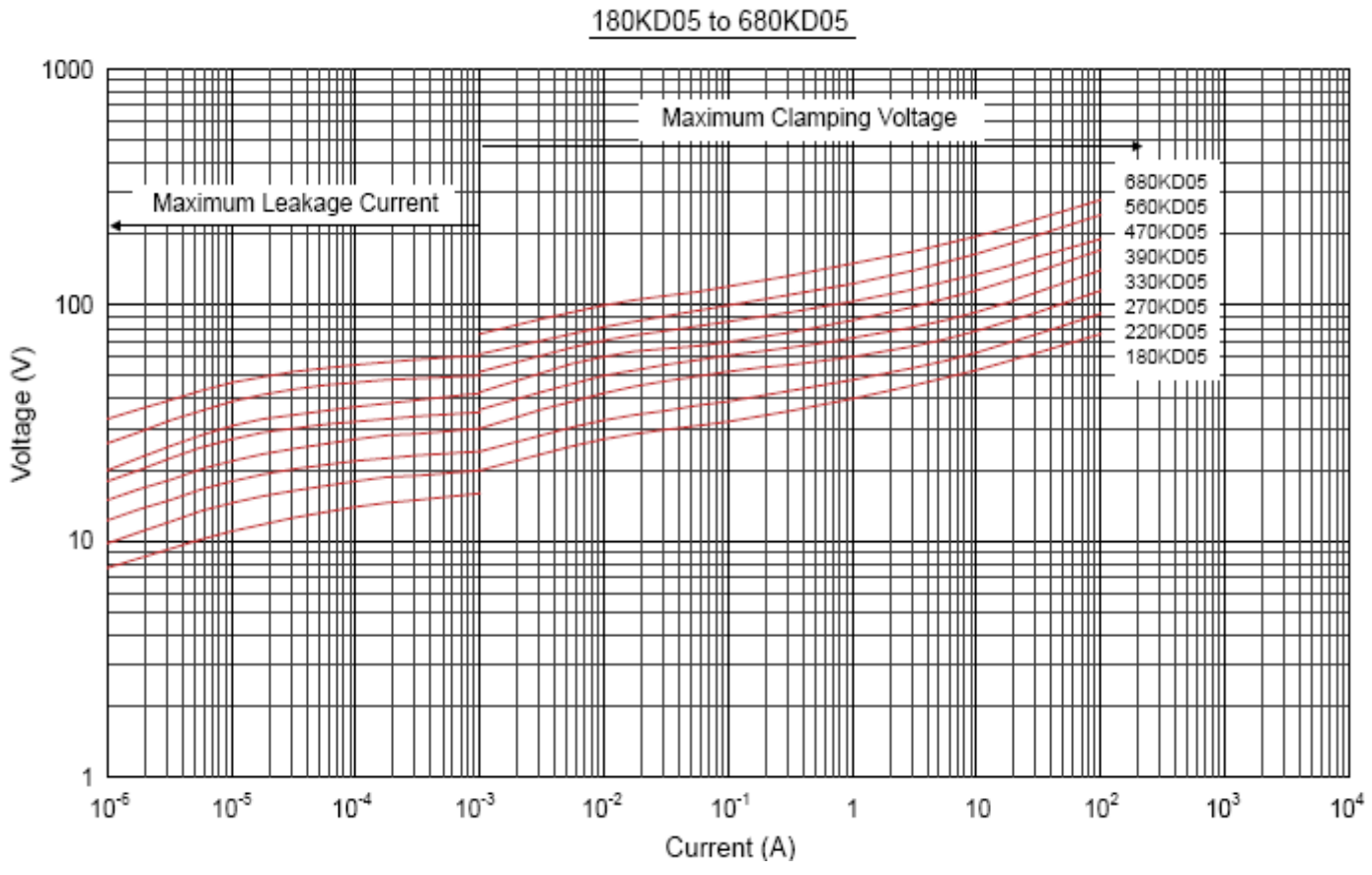
180KD05J to 680KD05J

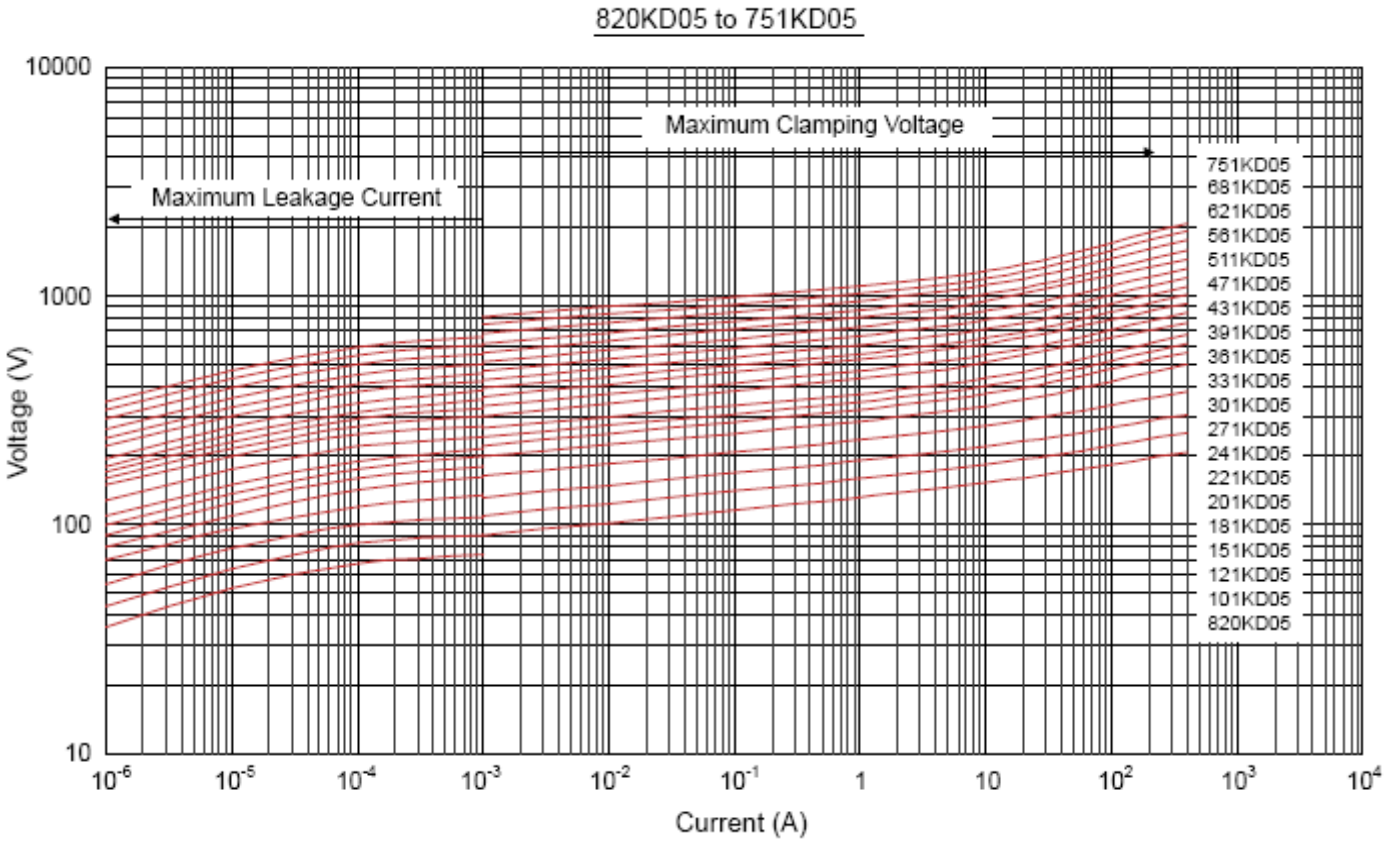


820KD05J to 751KD05J

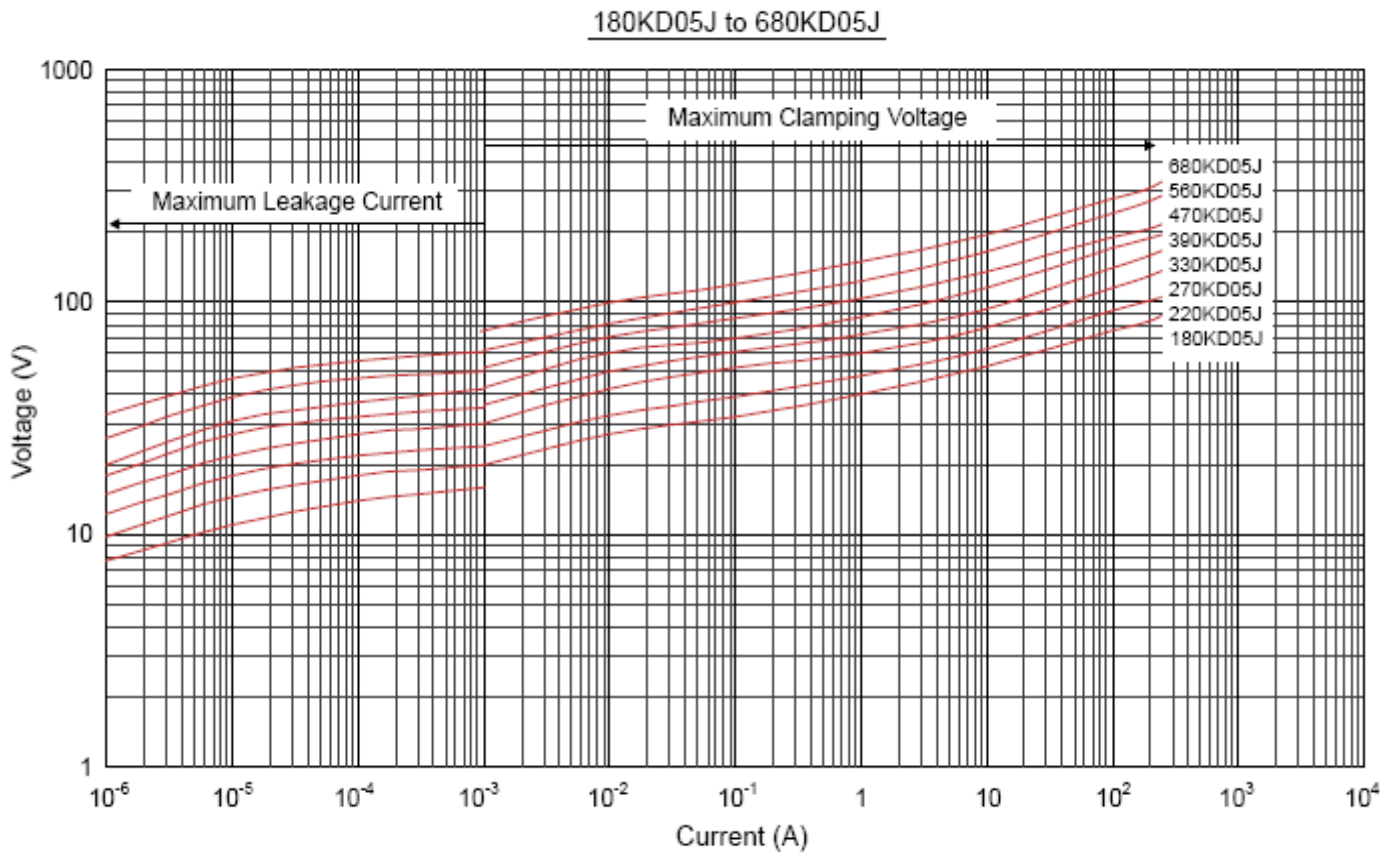


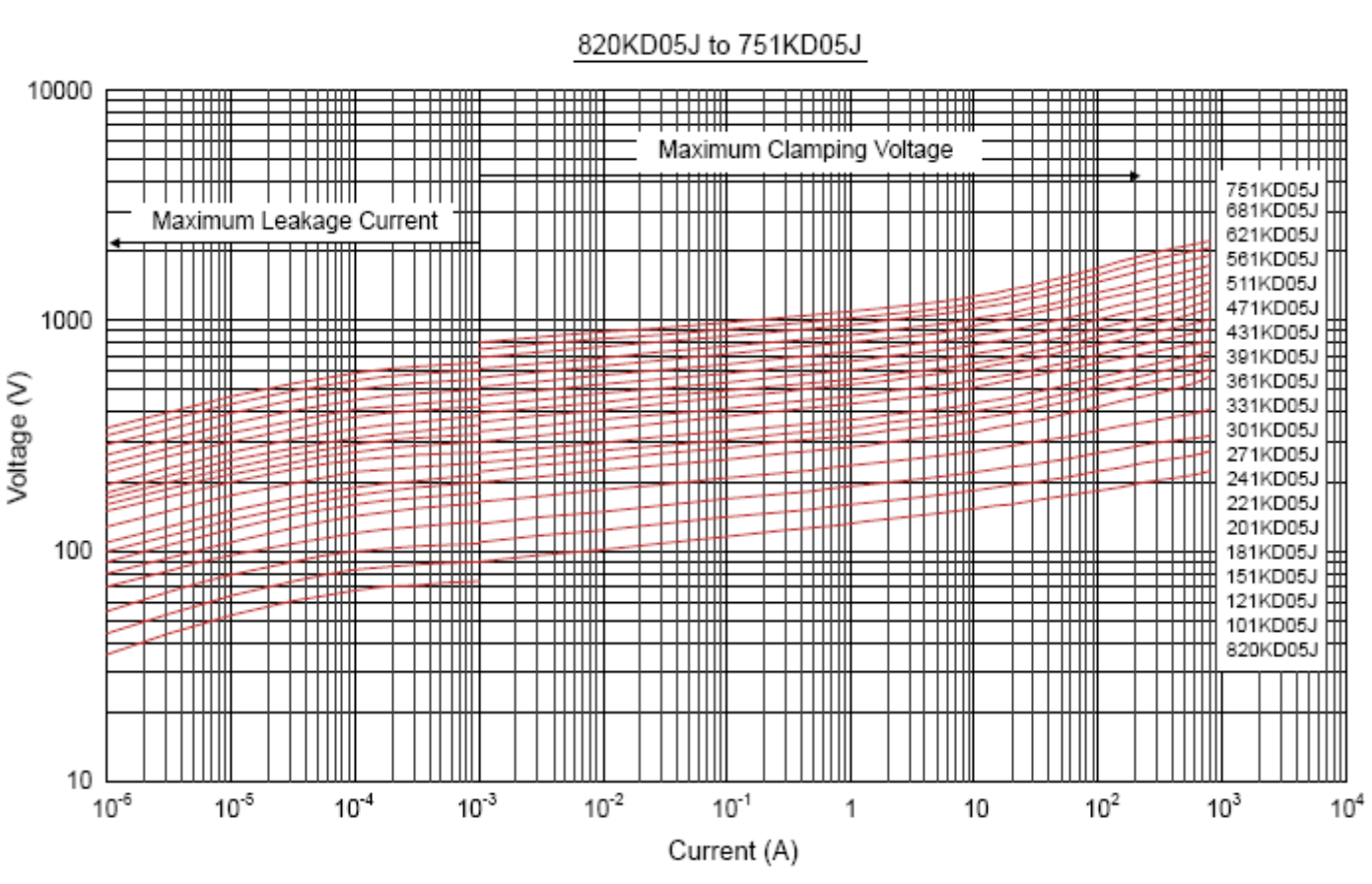
Maximum Leakage Current and Maximum Clamping Voltage Curve



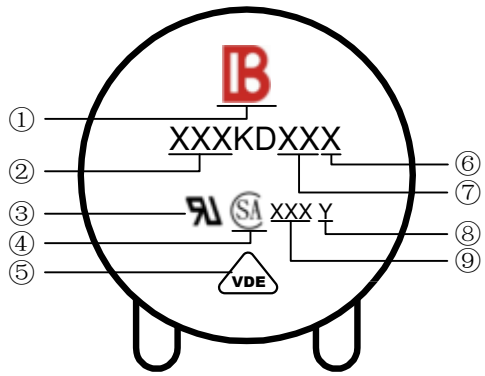


Maximum Leakage Current and Maximum Clamping Voltage Curve



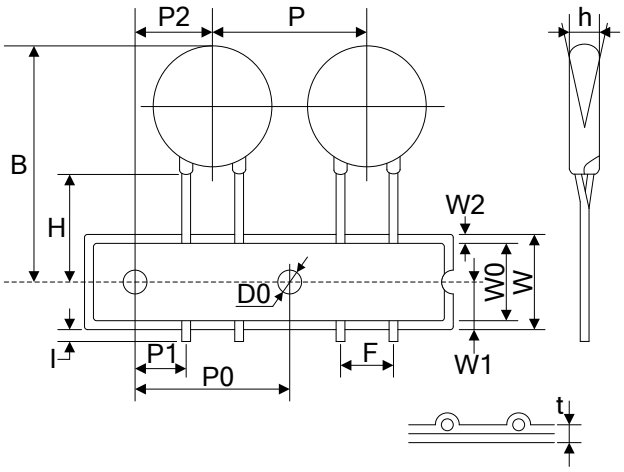


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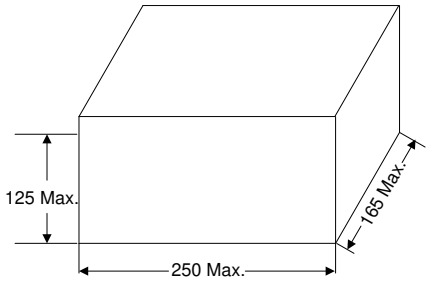
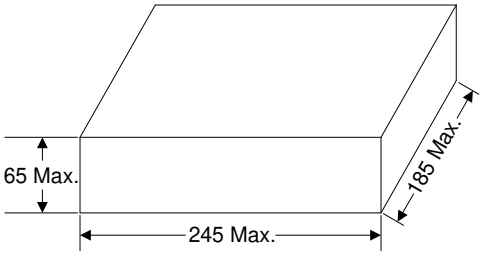
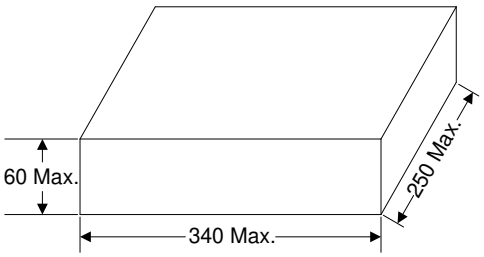
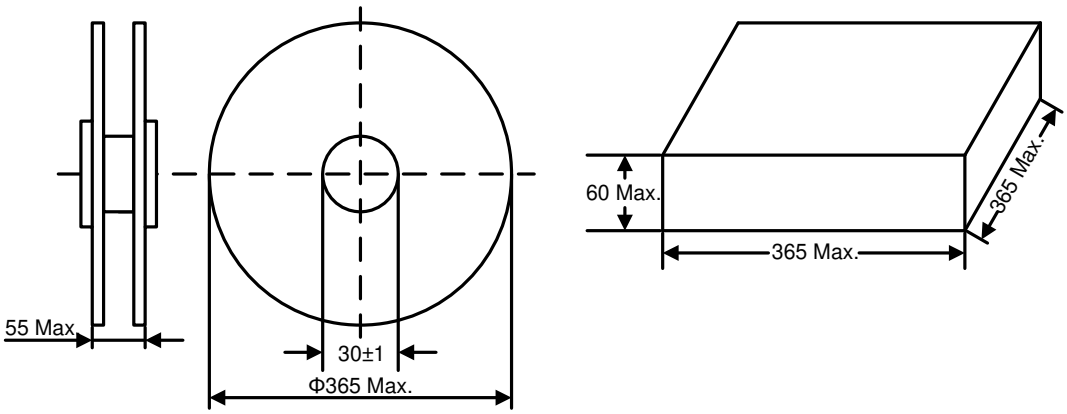
① Brightking Logo
② Varistor Voltage
③ UL Accreditation Logo
④ CSA Accreditation Logo
⑤ VDE Accreditation Logo
⑥ “J” is High Surge Code, no “J” is Standard Surge
⑦ Disk Size
⑧Product Line Code (“Y”may be A(a) thru Z(z))
⑨ Date Code

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)