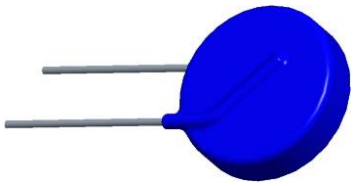
Metal Oxide Varistors

Version: A2 2023/12/30

Features

- Wide operating voltage (V_{1mA}) range from 18V to 1800V
- Fast responding to transient over-voltage
- Large absorbing transient energy capability
- Low clamping ratio and no follow-on current
- Moisture sensitivity level: Level 1
- Operating Temperature:-40℃~+105℃
- Storage Temperature:-40℃~+125℃

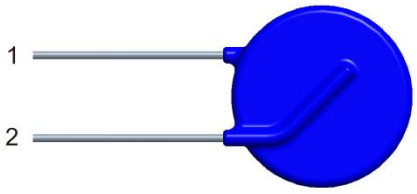
Exterior



Application information

- 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

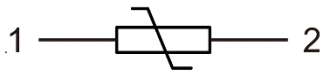
Package (Top View)



Agency Approvals

Icon	Description
RoHS	Compliance with 2011/65/EU
HF	Compliance with IEC61249-2-21:2003
Pb	Mean lead free
Safety certification	UL、TUV、CQC

Schematic Symbol



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)	IP (A)	VC (V)	I (A) Standard	I (A) High Surge	(J) Standard	(J) High Surge	(W)	@1KHz (pf)
20D180KXX	20D180KXXH	11	12	18(15~21.6)	20	36	2000	3000	11	13	0.2	28500
20D220KXX	20D220KXXH	14	18	22(19.5~26)	20	43	2000	3000	14	16	0.2	18500
20D270KXX	20D270KXXH	17	22	27(24~31)	20	53	2000	3000	16	19	0.2	13000
20D330KXX	20D330KXXH	20	26	33(29.5~36.5)	20	65	2000	3000	23	24	0.2	11500
20D390KXX	20D390KXXH	25	31	39(35~43)	20	77	2000	3000	26	28	0.2	8500
20D470KXX	20D470KXXH	30	38	47(42~52)	20	93	2000	3000	30	34	0.2	7400
20D560KXX	20D560KXXH	35	45	56(50~62)	20	110	2000	3000	38	44	0.2	6500
20D680KXX	20D680KXXH	40	56	68(61~75)	20	135	2000	3000	41	49	0.2	5800
20D820KXX	20D820KXXH	50	65	82(74~90)	100	145	6500	10000	45	56	1.0	4900

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)	IP (A)	VC (V)	I (A) Standard	I (A) High Surge	(J) Standard	(J) High Surge	(W)	@1KHz (pf)
20D101KXX	20D101KXXH	60	85	100(90~110)	100	165	6500	10000	50	70	1.0	4000
20D121KXX	20D121KXXH	75	100	120(108~132)	100	200	6500	10000	55	85	1.0	3300
20D151KXX	20D151KXXH	95	125	150(135~165)	100	250	6500	10000	70	106	1.0	2700
20D181KXX	20D181KXXH	115	150	180(162~198)	100	300	6500	10000	85	130	1.0	2200
20D201KXX	20D201KXXH	130	170	200(180~220)	100	340	6500	10000	95	140	1.0	2000
20D221KXX	20D221KXXH	140	180	220(198~242)	100	360	6500	10000	100	155	1.0	1800
20D241KXX	20D241KXXH	150	200	240(216~264)	100	395	6500	10000	108	168	1.0	1650
20D271KXX	20D271KXXH	175	225	270(243~297)	100	455	6500	10000	127	190	1.0	1500
20D301KXX	20D301KXXH	190	250	300(270~330)	100	500	6500	10000	136	210	1.0	1300
20D331KXX	20D331KXXH	210	275	330(297~363)	100	550	6500	10000	150	228	1.0	1200
20D361KXX	20D361KXXH	230	300	360(324~396)	100	595	6500	10000	163	255	1.0	1100
20D391KXX	20D391KXXH	250	320	390(351~429)	100	650	6500	10000	180	275	1.0	1000
20D431KXX	20D431KXXH	275	350	430(387~473)	100	710	6500	10000	190	305	1.0	930
20D471KXX	20D471KXXH	300	385	470(423~517)	100	775	6500	10000	204	350	1.0	850
20D511KXX	20D511KXXH	320	415	510(459~561)	100	845	6500	10000	210	360	1.0	780
20D561KXX	20D561KXXH	350	460	560(504~616)	100	925	6500	10000	215	380	1.0	710
20D621KXX	20D621KXXH	385	505	620(558~682)	100	1025	6500	10000	224	390	1.0	650
20D681KXX	20D681KXXH	420	560	680(612~748)	100	1120	6500	10000	230	400	1.0	600
20D751KXX	20D751KXXH	460	615	750(675~825)	100	1240	6500	10000	255	420	1.0	530
20D781KXX	20D781KXXH	485	640	780(702~858)	100	1290	6500	10000	265	440	1.0	510
20D821KXX	20D821KXXH	510	670	820(738~902)	100	1355	6500	10000	282	460	1.0	500
20D911KXX	20D911KXXH	550	745	910(819~1001)	100	1500	6500	10000	310	510	1.0	440
20D102KXX	20D102KXXH	625	825	1000(900~1100)	100	1650	6500	10000	342	565	1.0	400
20D112KXX	20D112KXXH	680	895	1100(990~1210)	100	1815	6500	10000	383	620	1.0	360
20D122KXX	20D122KXXH	750	990	1200(1080~1320)	100	1980	6500	10000	408	660	1.0	350
20D142KXX	20D142KXXH	880	1140	1400(1260~1540)	100	2310	6500	10000	532	784	1.0	340
20D162KXX	20D162KXXH	1000	1280	1600(1440~1760)	100	2640	6500	10000	606	896	1.0	330
20D182KXX	20D182KXXH	1100	1465	1800(1620~1980)	100	2970	6500	10000	625	990	1.0	320

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

2. Leakage Current (@83% of V1mA)：IR≤50μA (180K~680K) ; IR≤25μA (820K~182K).

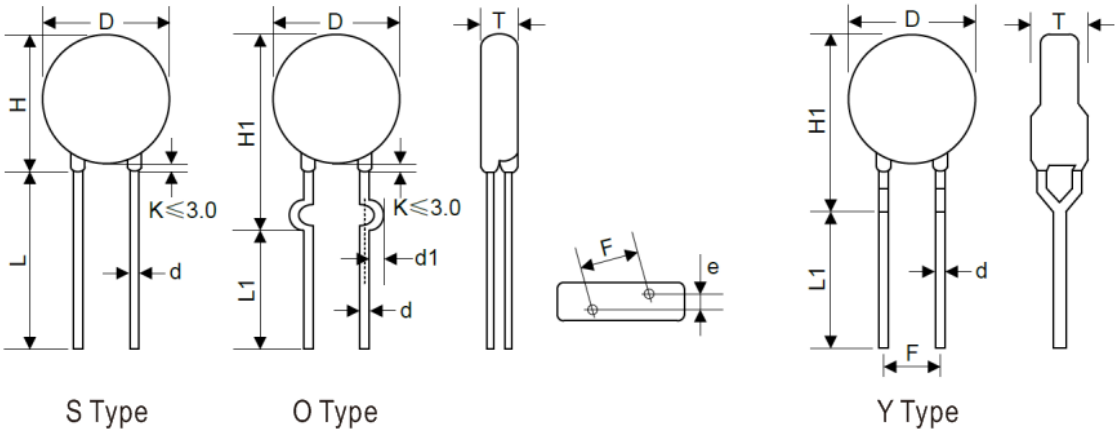
3. The foot shape can be customized according to customer needs.

Part Numbering System

B	M	O	V	2	0	D	4	7	1	K	S	C	H	0	1
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Bencent MOV	Element Diameter		Type	Varistor Voltage		Tolerance		Lead Shape		Packing		Internal control code
	07	Φ7mm	D: Disk	180	18V	K	±10%	S	Straight leads	C	Bulk	01~ZZ
	10	Φ10mm		101	100V	M	±20%	Y	Y Kinked leads	T	Tape & Box	No suffix: Standard type
	14	Φ14mm		102	1000V			O	Outside crimped leads	R	Tape & Reel	
	20	Φ20mm										

Dimensions



S Type O Type Y Type

Notes:The foot shape can be customized according to customer needs.

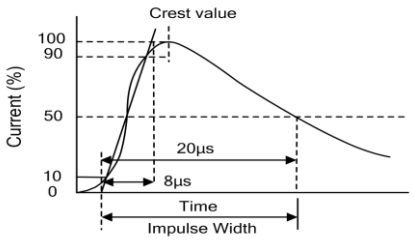
Unit: mm

Table 1	
Symbol	Dimension
H	21.0~26.0
H1	24.0~28.0
L(min)	20
L1(min)	15
D(max)	23
F	10±1
T	Table 2
e(±0. 8)	Table 2
d(±0. 05)	1
d1(±0. 4)	1. 6

Unit: mm

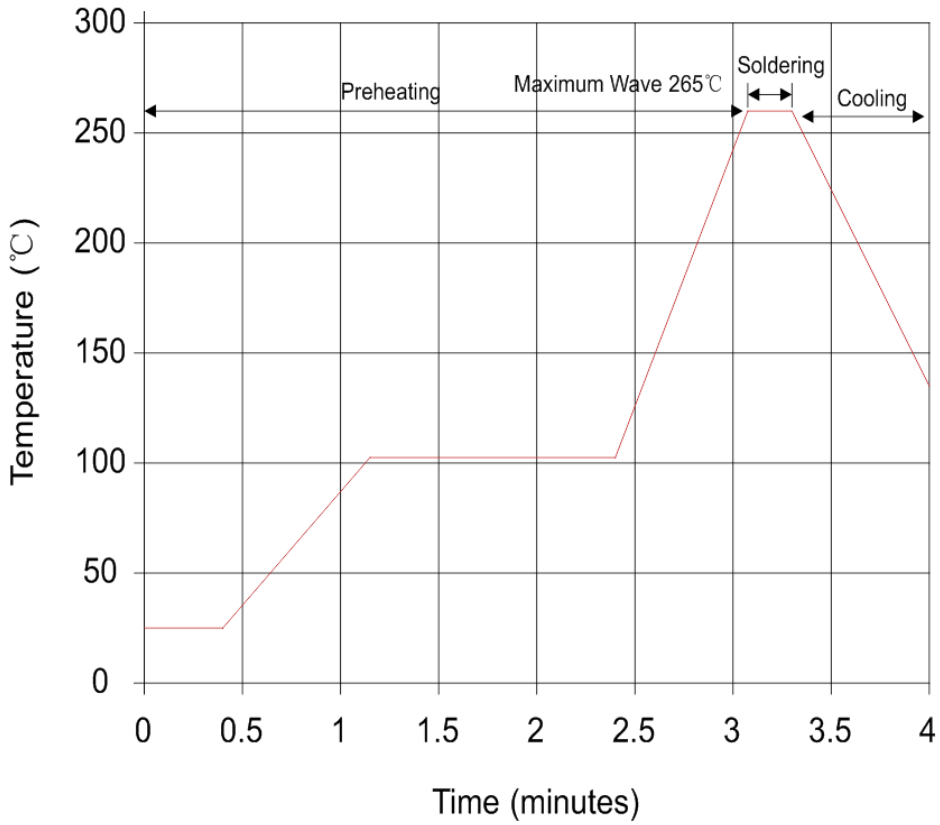
Table 2					
Model	T	e	Model	T	e
180K	3.0~4.7	1.6	361K	3.7~5.4	2.8
220K	3.0~4.9	1.7	391K	3.9~5.6	3.0
270K	3.1~5.1	1.8	431K	3.9~5.9	3.2
330K	3.5~5.4	1.9	471K	4.0~6.0	3.4
390K	3.1~5.5	2.0	511K	4.2~6.2	4.0
470K	3.1~4.9	2.1	561K	4.4~6.5	4.5
560K	3.4~5.1	2.2	621K	4.7~6.8	4.1
680K	3.2~5.3	2.5	681K	4.5~7.1	4.7
820K	2.8~4.7	2.0	751K	5.2~7.5	5.6
101K	3.1~4.9	2.2	781K	5.3~7.7	5.7
121K	3.3~5.1	2.2	821K	5.3~7.9	5.8
151K	2.8~5.4	2.0	911K	5.7~8.1	6.0
181K	2.8~4.7	2.1	102K	5.9~8.6	5.4
201K	2.9~4.9	2.2	112K	6.1~9.1	5.9
221K	2.9~4.9	2.2	122K	6.2~9.7	6.1
241K	3.1~5.0	2.3	142K	7.0~11.2	7.1
271K	3.2~5.2	2.4	162K	7.5~11.8	7.4
301K	3.4~5.2	2.5	182K	7.7~12.8	8.2
331K	3.6~5.4	2.5			

Electrical Ratings

Items	Test Condition/Description	Requirement
Varistor Voltage	The voltage between the two terminals with the specified measuring current 1mA.DC applied is called V_{1mA}.	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 the 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% withthe standard impulse current (8/20μs) applied one time.	
Varistor Voltage Temp. Coefficient	$\left\lvert \frac{V_{1mA@105℃}-V_{1mA@25℃}}{V_{1mA@25℃}} \times \frac{1}{80} \times 100\%(\%/℃) \right\rvert$	≤0.05%/℃
	$\left\lvert \frac{V_{1mA@-40℃}-V_{1mA@25℃}}{V_{1mA@25℃}} \times \frac{1}{65} \times 100\%(\%/℃) \right\rvert$	
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. 20Φ series: 180K to 680K — 100A (8/20μs); 820K to 182K — 200A (8/20μs)	$\frac{\Delta Vb}{Vb} \leq \pm 10\%$

Soldering Recommendation

Lead-free Wave 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℃
Soldering Time	3 seconds (max)
Distance from Varistor	2mm (min)

Mechanical Characteristics

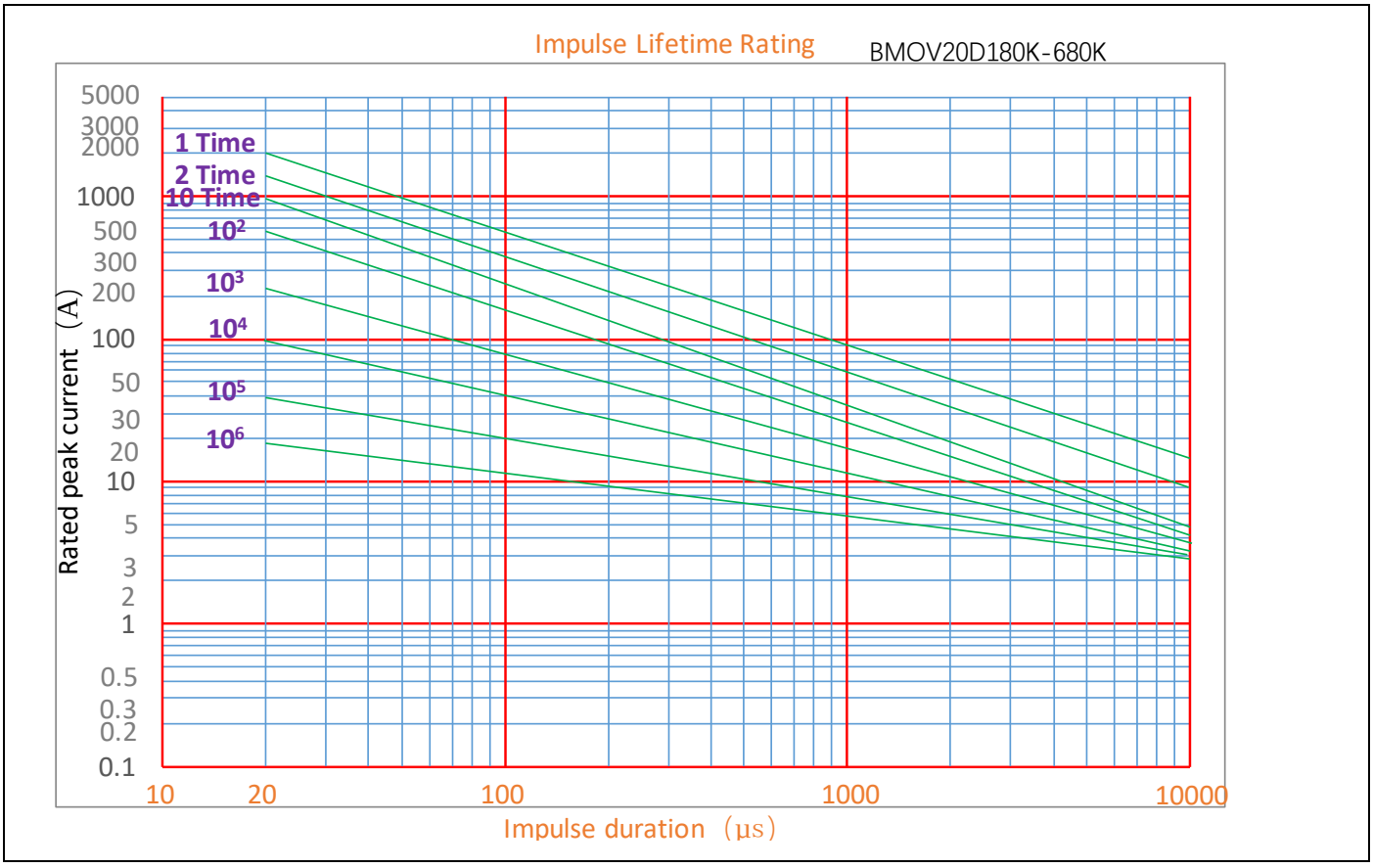
<table>
<tr><th>Items</th><th>Test conditions / Methods</th><th>Specifications</th></tr>
<tr><td>Tensile Strength of Terminals</td><td>Gradually applying the force specified and keeping the unit fixed for 10±1 sec
<table>
<tr><th>Terminal diameter (mm)</th><th>Force (kg)</th></tr>
<tr><td>0.5＜d≤0.8</td><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></td><td>No visible damage
|△V1mA/V1mA |≤5%</td></tr>
<tr><td>Bending Strength of Terminals</td><td>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><th>Terminal diameter (mm)</th><th>Force (kg)</th></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></td><td>No visible damage
|△V1mA/V1mA |≤5%</td></tr>
<tr><td>Vibration</td><td>Frequency range: 10~55 Hz
Amplitude: 0.75mm or 98m/s^2
Direction: 3 mutually perpendicular directions, 2hrs each.</td><td>No visible damage
|△V1mA/V1mA |≤5%</td></tr>
<tr><td>Solder ability</td><td>Solder Temp: 245±5˚C
Dipping Time: 2±0.5 sec</td><td>Atleast 95% of terminal electrode is covered by new solder</td></tr>
<tr><td>Resistance to Soldering Heat</td><td>Solder Temp: 260±5˚C
Dipping Time: 10±1 sec</td><td>No visible damage
|△V1mA/V1mA |≤10%</td></tr>
</table>

Reliability

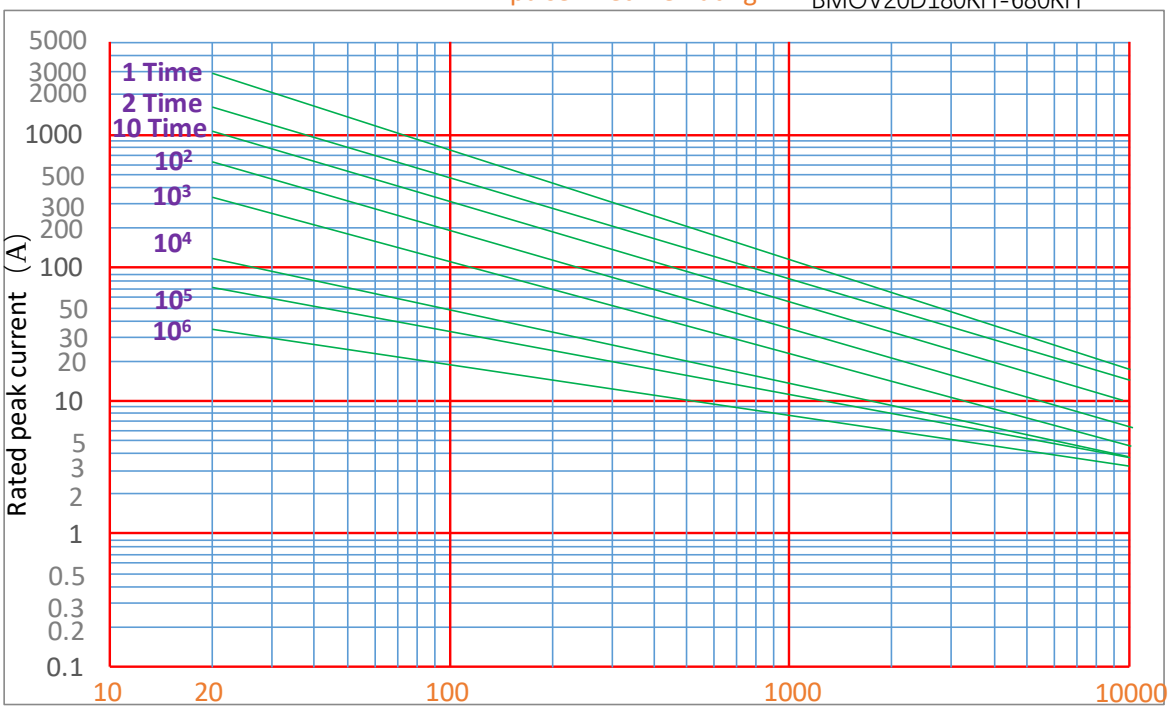
<table>
<tr><th>Items</th><th>Test conditions / Methods</th><th>Specifications</th></tr>
<tr><td>High Temperature Storage</td><td>Ambient Temp: 125±2˚C
Duration: 1000hrs</td><td>|△V1mA/V1mA |≤5%</td></tr>
<tr><td>Low Temperature Storage</td><td>Ambient Temp: -40±2˚C
Duration: 1000hrs</td><td>|△V1mA/V1mA |≤5%</td></tr>
<tr><td>Humidity</td><td>Ambient Temp: 40±2˚C, 90~95% R.H.
Duration: 1000hrs</td><td>|△V1mA/V1mA |≤5%</td></tr>
<tr><td>Temperature Cycle</td><td>The conditions shown below shall be repeated 5 cycles
<table>
<tr><th>Step</th><th>Temperature (˚C)</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></td><td>No visible damage
|△V1mA/V1mA |≤5%</td></tr>
</table>

Items	Test conditions / Methods	Specifications
High Temperature Load	Ambient Temp: 105±2˚C Duration: 1000hrs Load: Max. Allowable Voltage In AC eara.	|△V1mA/V1mA |≤10%
Damp Heat Load	Ambient Temp: 40±2˚C, 90~95% R.H. Duration: 1000hrs Load: Max. Allowable Voltage	No visible damage |△V1mA/V1mA |≤10%
Voltage Proof	Metal balls method, 1000Vac 1 min.(180K~331K), 1500Vac 1 min.(361K~182K)	No visible damage

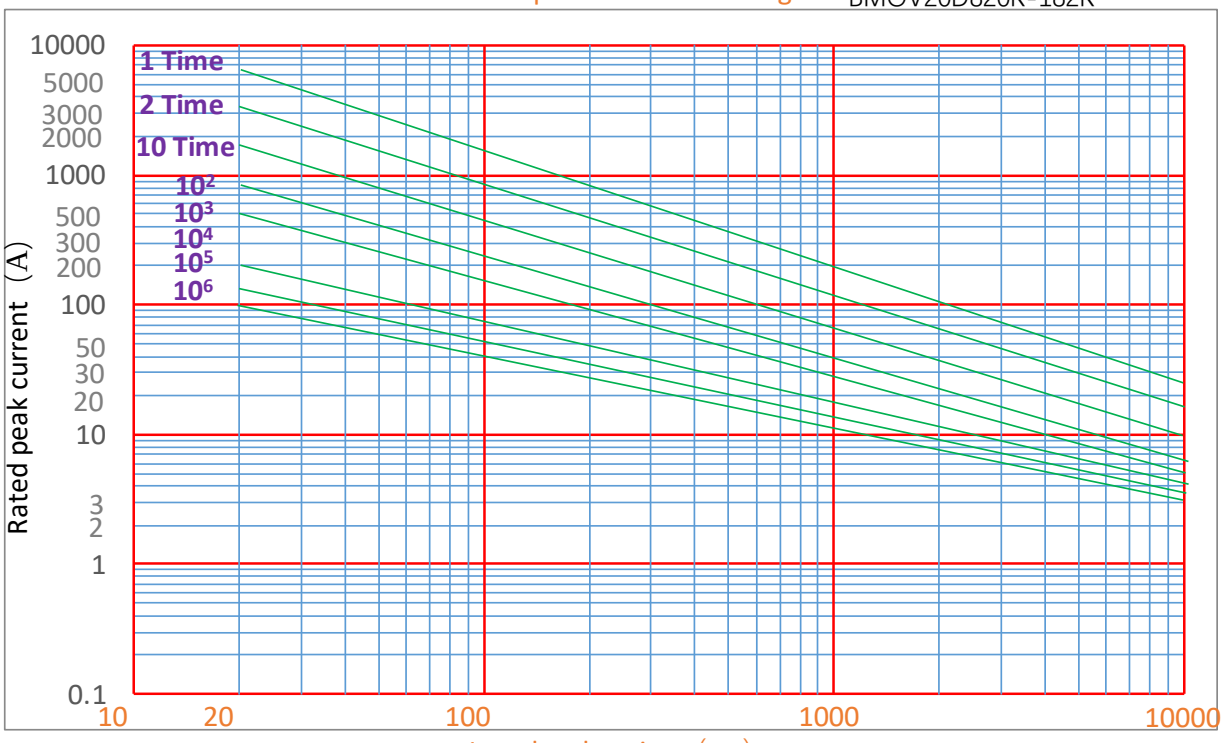
Maximum Surge Current Derating Curve

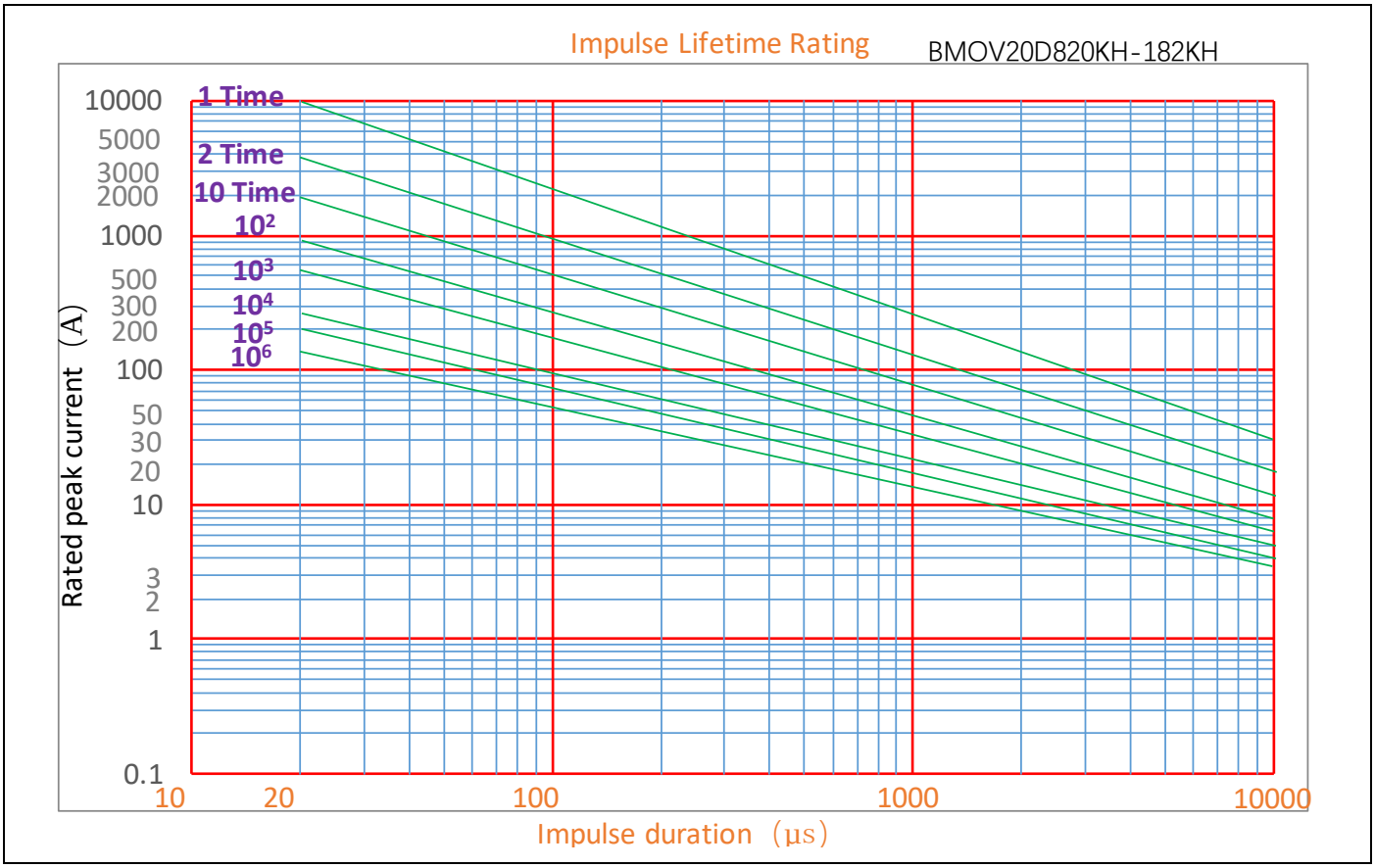


Impulse Lifetime Rating BMOV20D180KH-680KH

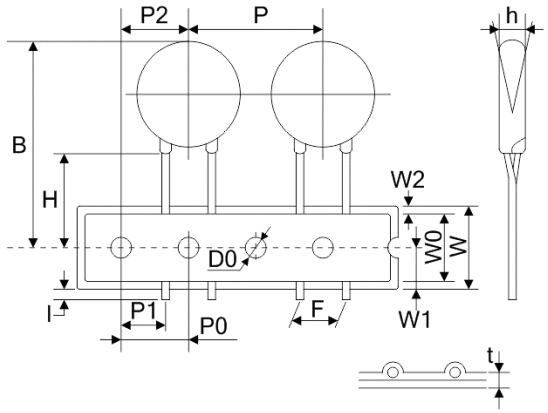


Impulse Lifetime Rating BMOV20D820K-182K



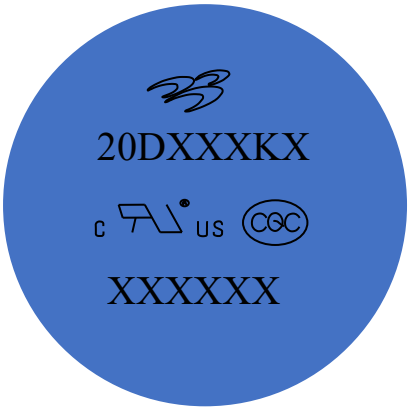


Taping Dimensions



Symbol	Dimension (mm)
P	25.4±1.0
P0	12.7±1.0
P1	7.7±0.7
P2	12.7±1.3
F	10.0±1.0
h	0±4
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	45max

Marking Code



: Bencent

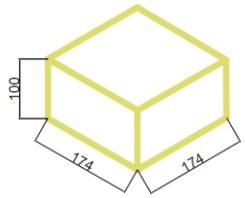
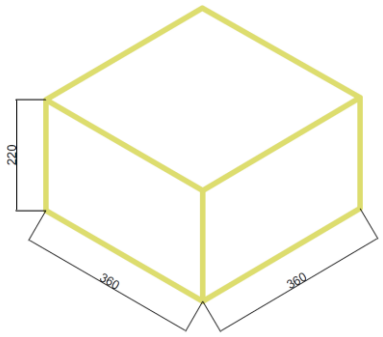
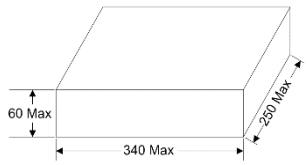
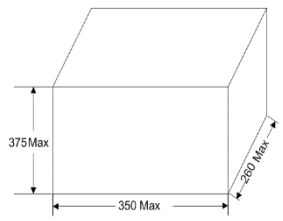
20: Disk 20mm; **D**:Rotundity; **XXXK**: Varistor Voltage
X:**X is H**-High surge code, no 'X' is standard

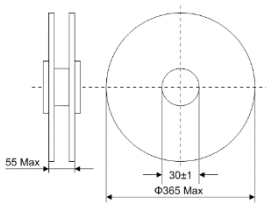
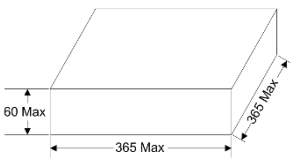
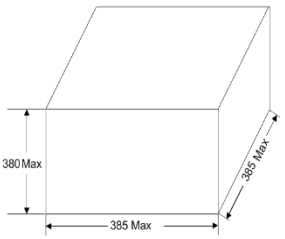
: UL\CQC Mark

XX: Control code; **X**: Year ; **X**: Month
XX: Date

Quantity

Packaging Dimensions (Unit: mm)

Inner box size	Outer box size	Quantity
Bulk 		250pcs/bag 2bags/Inner box (180K~301K)
		200pcs/bag 2bags/ Inner box (331K~561K)
		150pcs/bag 2bags/ Inner box (621K~112K)
		100pcs/bag 2bags/ Inner box (122K~182K)
Tape & Box 		400pcs/box (180K~301K)
		300pcs/box (331K~561K)
		150pcs/box (621K~112K)

Reel size	Inner box size	Outer box size	Quantity
Tape & Reel 			400pcs/reel (180K~301K)
			300pcs/reel (331K~561K)
			150pcs/reel (621K~112K)