

Metal Oxide Varistors

Features

- Wide operating voltage (V_{1mA}) range from 18V to 820V
- 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: $-40^{\circ}\text{C}\sim+105^{\circ}\text{C}$
- Storage Temperature: $-40^{\circ}\text{C}\sim+125^{\circ}\text{C}$

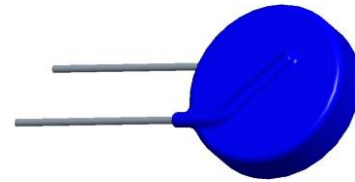
Application information

- 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

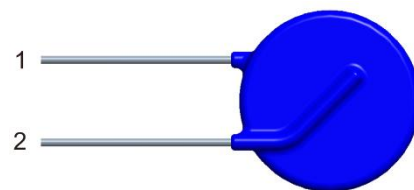
Agency Approvals

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

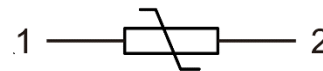
Exterior



Package (Top View)



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)
07D180KXX	07D180KXXH	11	12	18(15~21.6)	2.5	36	250	500	0.9	2.0	0.02	2800
07D220KXX	07D220KXXH	14	18	22(19.5~26)	2.5	43	250	500	1.1	2.4	0.02	2300
07D270KXX	07D270KXXH	17	22	27(24~31)	2.5	53	250	500	1.4	3.0	0.02	1800
07D330KXX	07D330KXXH	20	26	33(29.5~36.5)	2.5	65	250	500	1.7	3.5	0.02	1500
07D390KXX	07D390KXXH	25	31	39(35~43)	2.5	77	250	500	2.1	4.0	0.02	1300
07D470KXX	07D470KXXH	30	38	47(42~52)	2.5	93	250	500	2.5	5.0	0.02	1100
07D560KXX	07D560KXXH	35	45	56(50~62)	2.5	110	250	500	3.1	6.0	0.02	890
07D680KXX	07D680KXXH	40	56	68(61~75)	2.5	135	250	500	3.6	7.0	0.02	740
07D820KXX	07D820KXXH	50	65	82(74~90)	10	145	1200	1750	5.0	10.0	0.25	600

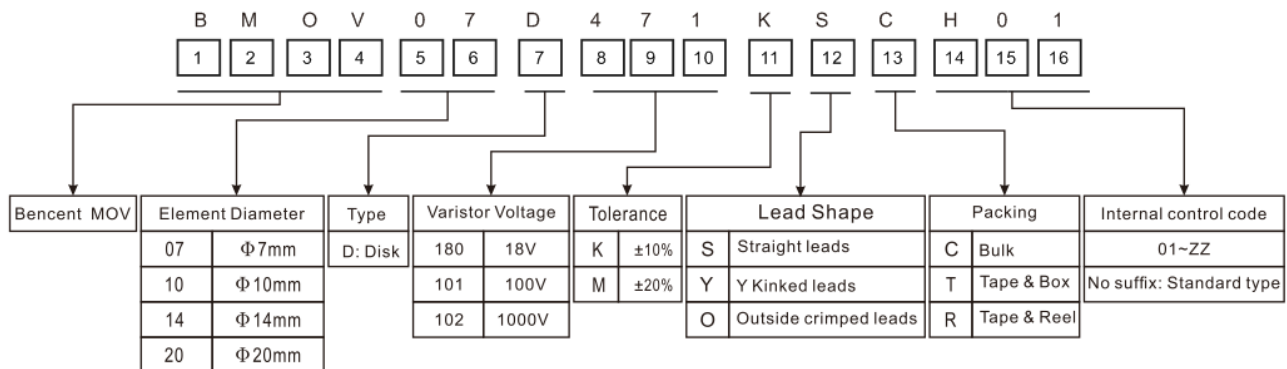
Part Number		Maximum Allowable Voltage		Varistor Voltage	Maximum Clamping Voltage		Withstanding Surge Current		Maximum Energy (10/1000μs)		Rated Power	Typical Capacitance (Reference)
Standard	High Surge	V _{AC} (V)	V _{DC} (V)	V _{1mA} (V)	I _P (A)	V _C (V)	I (A) Standard	I (A) High Surge	(J) Standard	(J) High Surge	(W)	@1KHz (pF)
07D101KXX	07D101KXXH	60	85	100(90~110)	10	165	1200	1750	7.0	12.5	0.25	500
07D121KXX	07D121KXXH	75	100	120(108~132)	10	200	1200	1750	7.8	13.0	0.25	420
07D151KXX	07D151KXXH	95	125	150(135~165)	10	250	1200	1750	9.7	15.0	0.25	330
07D181KXX	07D181KXXH	115	150	180(162~198)	10	300	1200	1750	11.7	16.0	0.25	280
07D201KXX	07D201KXXH	130	170	200(180~220)	10	340	1200	1750	13.0	17.0	0.25	250
07D221KXX	07D221KXXH	140	180	220(198~242)	10	360	1200	1750	14.0	19.0	0.25	230
07D241KXX	07D241KXXH	150	200	240(216~264)	10	395	1200	1750	15.0	21.0	0.25	210
07D271KXX	07D271KXXH	175	225	270(243~297)	10	455	1200	1750	18.0	24.0	0.25	185
07D301KXX	07D301KXXH	190	250	300(270~330)	10	500	1200	1750	20.0	26.0	0.25	165
07D331KXX	07D331KXXH	210	275	330(297~363)	10	550	1200	1750	23.0	28.0	0.25	150
07D361KXX	07D361KXXH	230	300	360(324~396)	10	595	1200	1750	24.0	32.0	0.25	140
07D391KXX	07D391KXXH	250	320	390(351~429)	10	650	1200	1750	26.0	35.0	0.25	130
07D431KXX	07D431KXXH	275	350	430(387~473)	10	710	1200	1750	28.0	40.0	0.25	115
07D471KXX	07D471KXXH	300	385	470(423~517)	10	775	1200	1750	29.0	42.0	0.25	105
07D511KXX	07D511KXXH	320	415	510(459~561)	10	845	1200	1750	31.0	45.0	0.25	100
07D561KXX	07D561KXXH	350	460	560(504~616)	10	925	1200	1750	35.0	49.0	0.25	90
07D621KXX	07D621KXXH	385	505	620(558~682)	10	1025	1200	1750	38.0	55.0	0.25	80
07D681KXX	07D681KXXH	420	560	680(612~748)	10	1120	1200	1750	42.0	60.0	0.25	75
07D751KXX	07D751KXXH	460	615	750(675~825)	10	1240	1200	1750	45.0	64.0	0.25	70
07D781KXX	07D781KXXH	485	640	780(702~858)	10	1290	1200	1750	48.0	69.0	0.25	65
07D821KXX	07D821KXXH	510	670	820(738~902)	10	1355	1200	1750	52.0	73.0	0.25	60

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

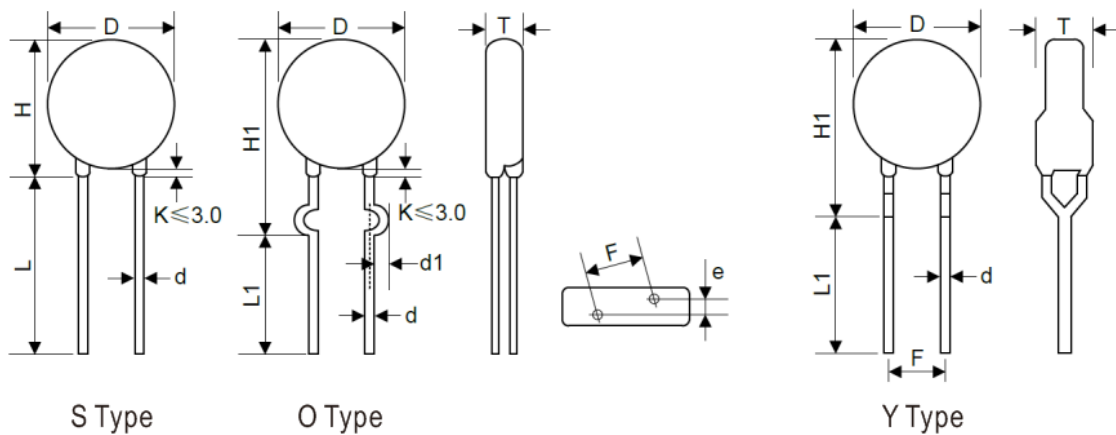
2. Leakage Current (@83% of V_{1mA}): IR≤50μA (180K~680K) ; IR≤25μA (820K~821K).

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

Part Numbering System



Dimensions



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

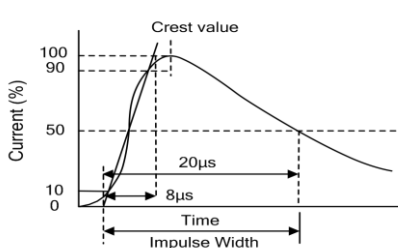
Unit: mm

Table 1	
Symbol	Dimension
H	7.5~13.0
H1	9.0~13.5
L(min)	20
L1(min)	15
D(max)	7.0~10.0
F	5.0±0.8
T	Table 2
e(±0.8)	Table 2
d(±0.05)	0.6
d1(±0.4)	1.2

Unit: mm

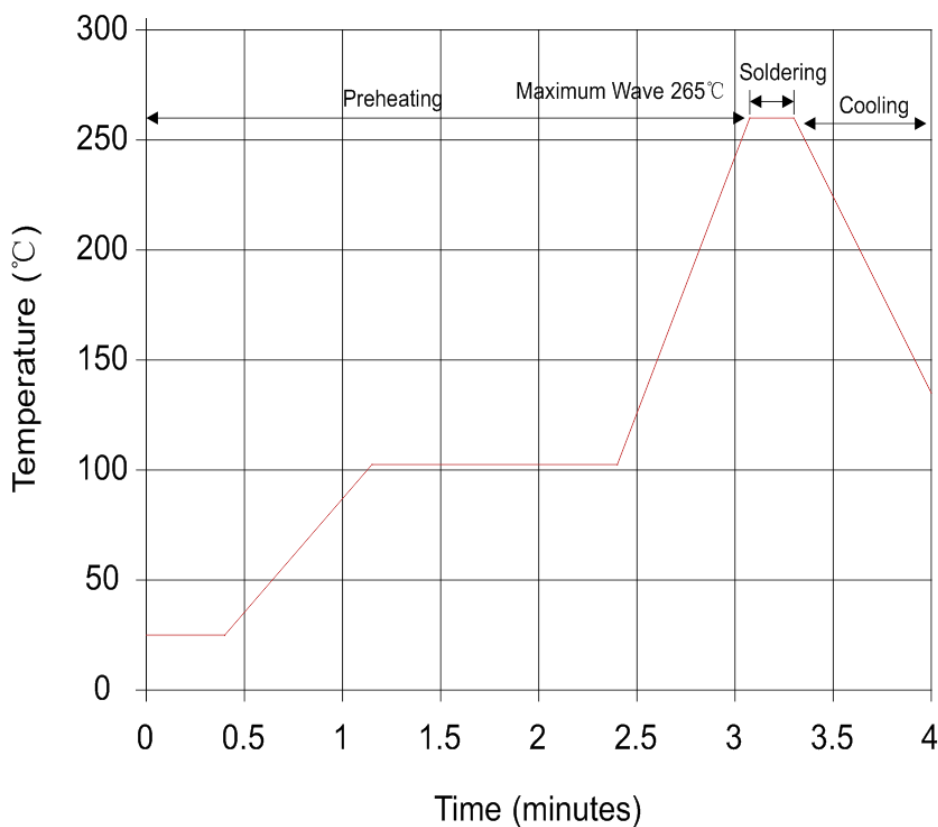
Table 2					
Model	T	e	Model	T	e
180K	2.03~4.85	1.3	241K	2.47~5.53	2.0
220K	2.18~4.98	1.4	271K	2.57~5.71	2.2
270K	2.23~5.17	1.6	301K	2.66~5.88	2.3
330K	2.36~5.35	1.5	331K	2.76~6.06	2.3
390K	2.31~5.16	1.6	361K	2.86~6.24	2.5
470K	2.44~5.37	1.7	391K	2.95~6.42	2.6
560K	2.58~5.60	1.8	431K	3.08~6.66	2.8
680K	2.77~5.88	2.0	471K	3.21~6.89	3.0
820K	2.18~4.89	1.4	511K	3.34~7.13	3.2
101K	2.28~5.06	1.6	561K	3.50~7.43	3.4
121K	2.40~5.26	1.7	621K	3.69~7.79	3.7
151K	2.18~4.99	1.8	681K	3.89~8.14	4.0
181K	2.28~5.17	1.7	751K	4.11~8.56	4.1
201K	2.36~5.32	1.8	781K	4.21~8.74	4.2
221K	2.41~5.41	1.9	821K	4.34~8.98	4.4

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 $\pm 10\%$ when one impulse of 10/1000 μ s or 2ms is applied.						
Withstanding Surge Current	The maximum current within the varistor voltage change of $\pm 10\%$ with the standard impulse current (8/20 μ s) 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 $	$\leq 0.05\%/^{\circ}C$					
	$\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 $						
Surge Life	The change of V_b 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="491 1657 1158 1731"> <tr> <td rowspan="2">07Φ series</td><td>180K to 680K</td><td>25A (8/20μs)</td></tr> <tr> <td>820K to 821K</td><td>50A (8/20μs)</td></tr> </table>	07 Φ series	180K to 680K	25A (8/20 μ s)	820K to 821K	50A (8/20 μ s)	$\frac{\Delta V_b}{V_b} \leq \pm 10\%$
07 Φ series	180K to 680K		25A (8/20 μ s)				
	820K to 821K	50A (8/20 μ s)					

Soldering Recommendation

Lead-free Wave Soldering Recommendation



	Item	Conditions
Preheating	Room Temp. to 110 (100-110) °C	30-50 seconds
	100-110°C	60-70s seconds
	110°C to Soldering Temp.	30-50s seconds
Soldering	Peak Temp.	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
Soldering Time	3 seconds (max)
Distance from Varistor	2mm (min)

Mechanical Characteristics

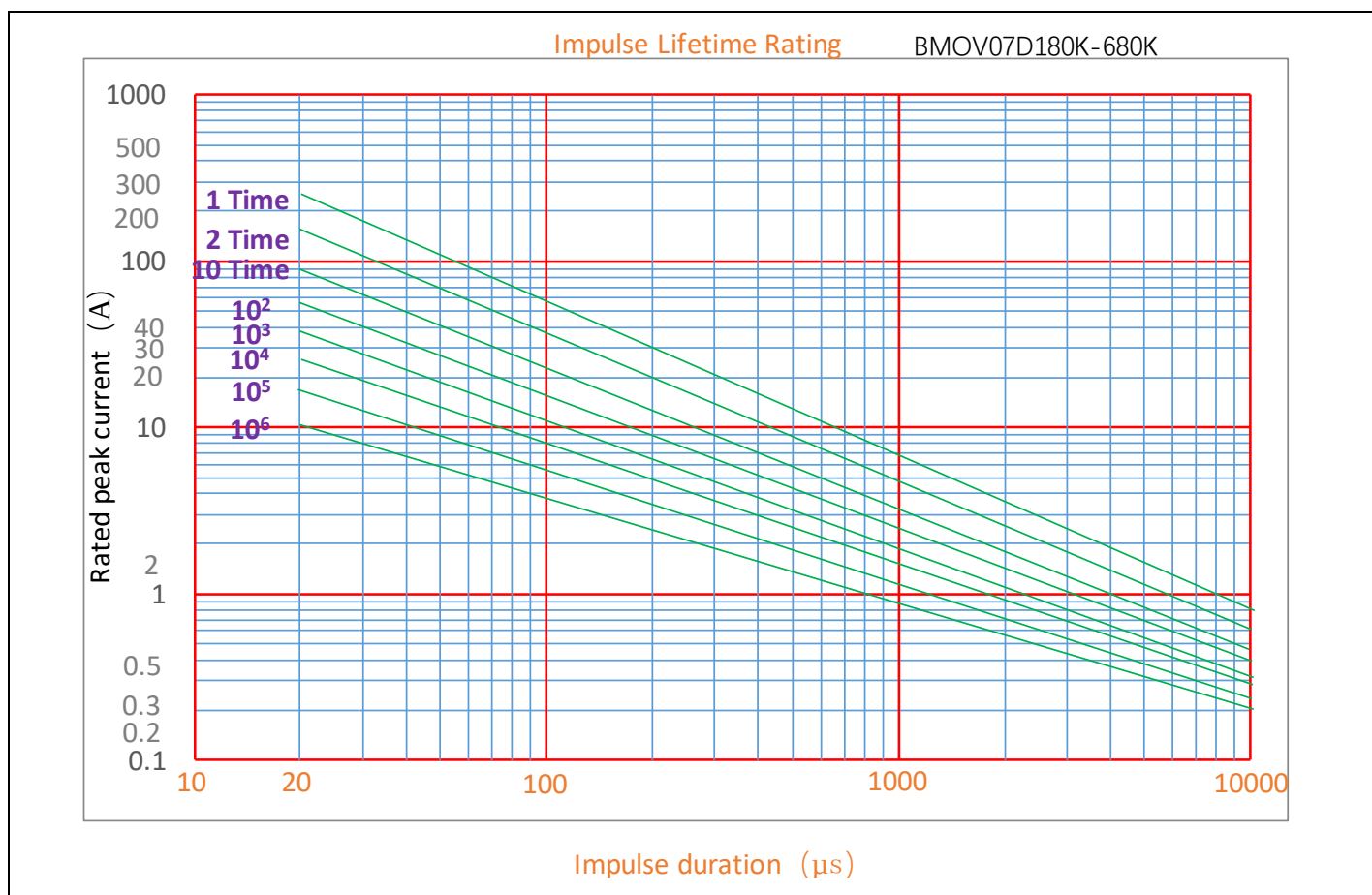
Items	Test conditions / Methods	Specifications
Tensile Strength of Terminals	Gradually applying the force specified and keeping the unit fixed for 10±1 sec	No visible damage ΔV1mA/V1mA ≤5%
	Terminal diameter (mm)	
	Force (kg)	
	0.5 < d ≤ 0.8	
Bending Strength of Terminals	Hold specimen and apply the force specified below to each lead. Bend the specimen to 90°, then return to the original position. Repeat the procedure in the opposite direction.	No visible damage ΔV1mA/V1mA ≤5%
	Terminal diameter (mm)	
	Force (kg)	
	0.5 < d ≤ 0.8	
Vibration	Frequency range: 10~55 Hz Amplitude: 0.75mm or 98m/s ² Direction: 3 mutually perpendicular directions, 2hrs each.	No visible damage ΔV1mA/V1mA ≤5%
Solder ability	Solder Temp: 245±5°C Dipping Time: 2±0.5 sec	Atleast 95% of terminal electrode is covered by new solder
Resistance to Soldering Heat	Solder Temp: 260±5°C Dipping Time: 10±1 sec	No visible damage ΔV1mA/V1mA ≤10%

Reliability

Items	Test conditions / Methods	Specifications
High Temperature Storage	Ambient Temp: 125±2°C Duration: 1000hrs	ΔV1mA/V1mA ≤5%
Low Temperature Storage	Ambient Temp: -40±2°C Duration: 1000hrs	ΔV1mA/V1mA ≤5%
Humidity	Ambient Temp: 40±2°C, 90~95% R.H. Duration: 1000hrs	ΔV1mA/V1mA ≤5%
Temperature Cycle	The conditions shown below shall be repeated 5 cycles	No visible damage ΔV1mA/V1mA ≤5%
	Step	
	Temperature (°C)	
	Period (minutes)	
	1	
Temperature Cycle	2	No visible damage ΔV1mA/V1mA ≤5%
	3	
	4	

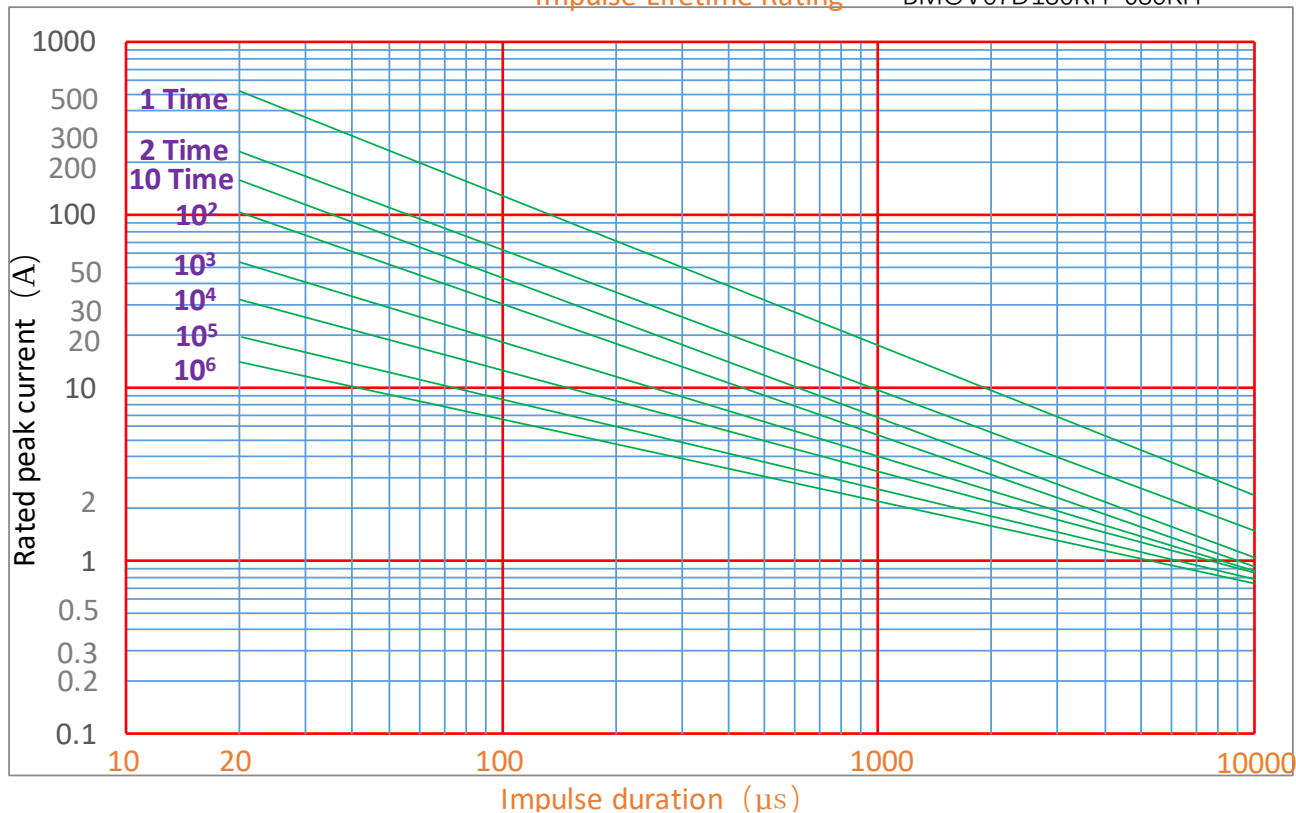
Items	Test conditions / Methods	Specifications
High Temperature Load	Ambient Temp: 105±2°C Duration: 1000hrs Load: Max. Allowable Voltage In AC .	$ \Delta V_{1mA}/V_{1mA} \leq 10\%$
Damp Heat Load	Ambient Temp: 40±2°C, 90~95% R.H. Duration: 1000hrs Load: Max. Allowable Voltage	No visible damage $ \Delta V_{1mA}/V_{1mA} \leq 10\%$
Voltage Proof	Metal balls method, 1000Vac 1 min.(180K~331K), 1500Vac 1 min.(361K~821K)	No visible damage

Maximum Surge Current Derating Curve



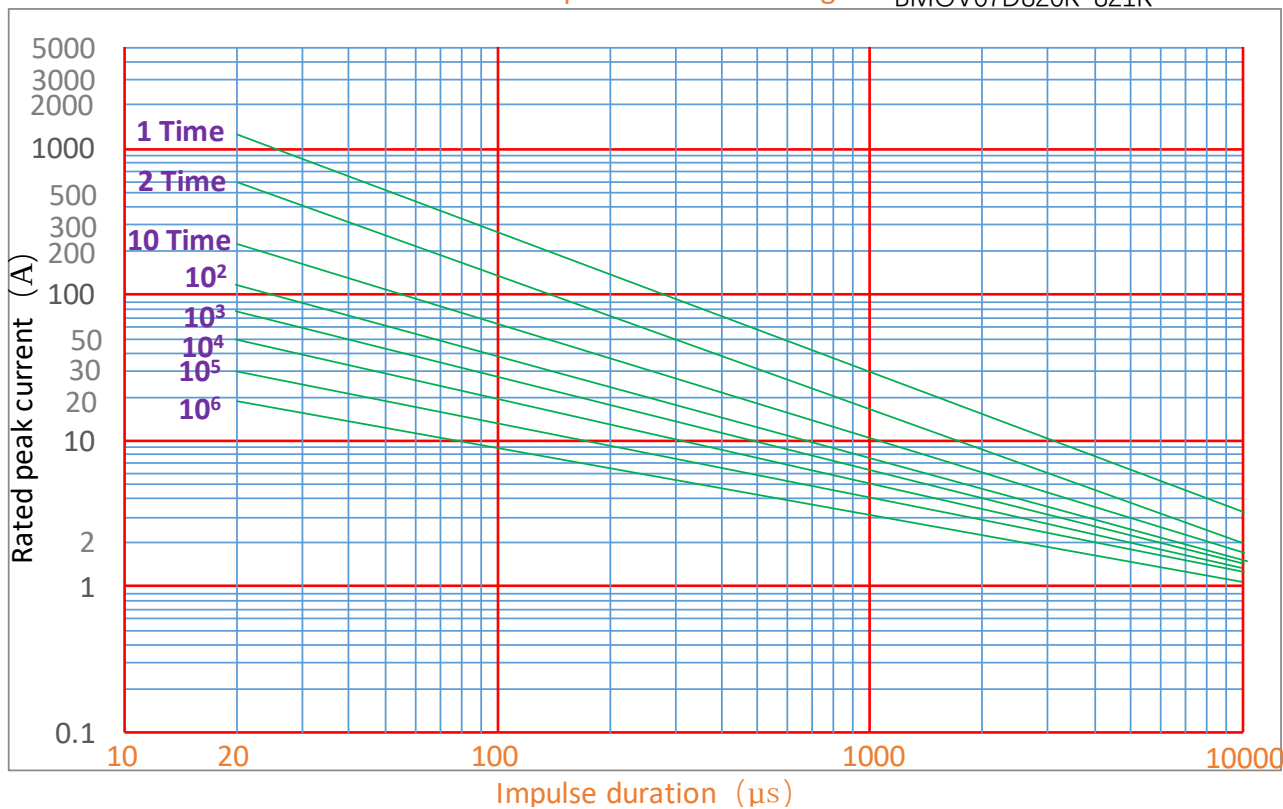
Impulse Lifetime Rating

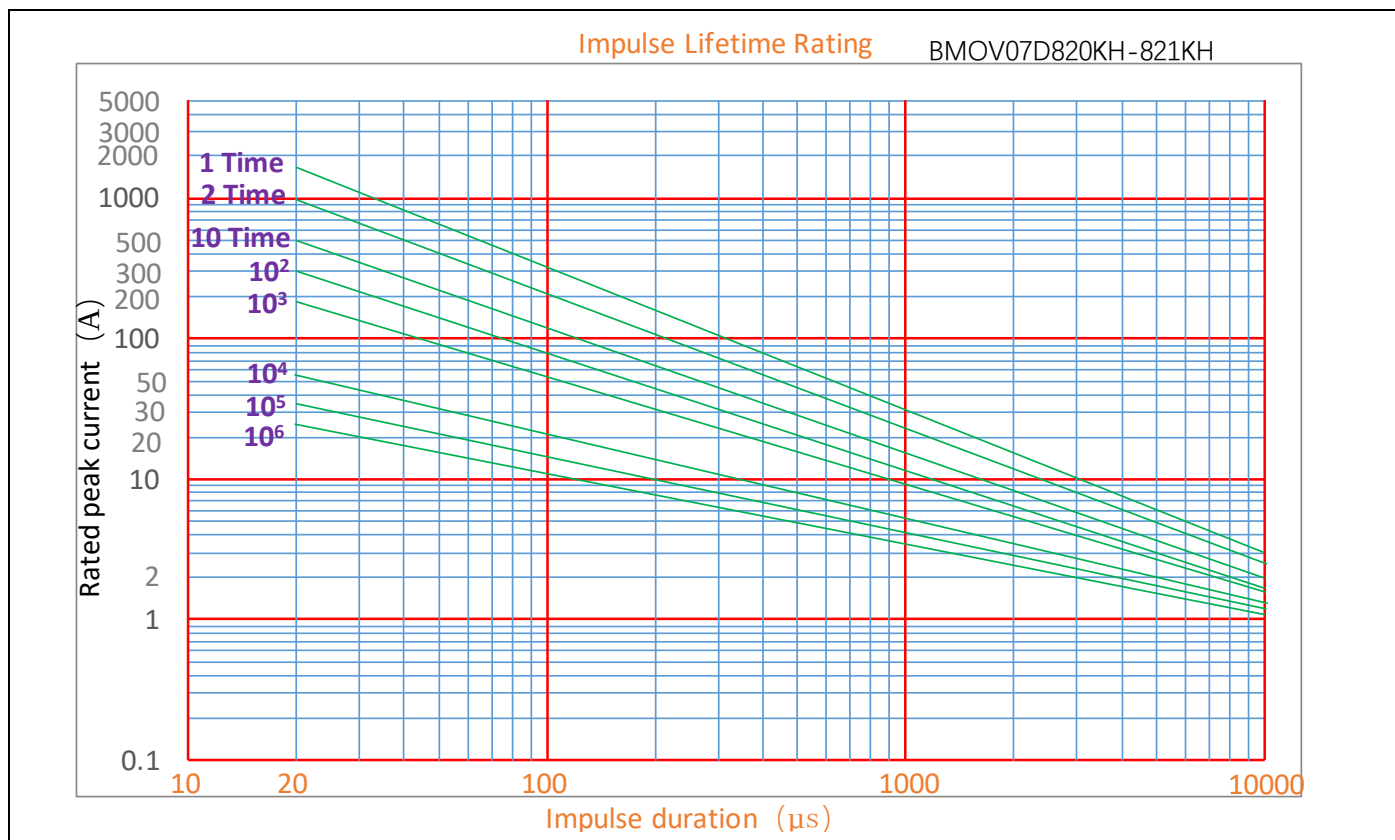
BMOV07D180KH-680KH



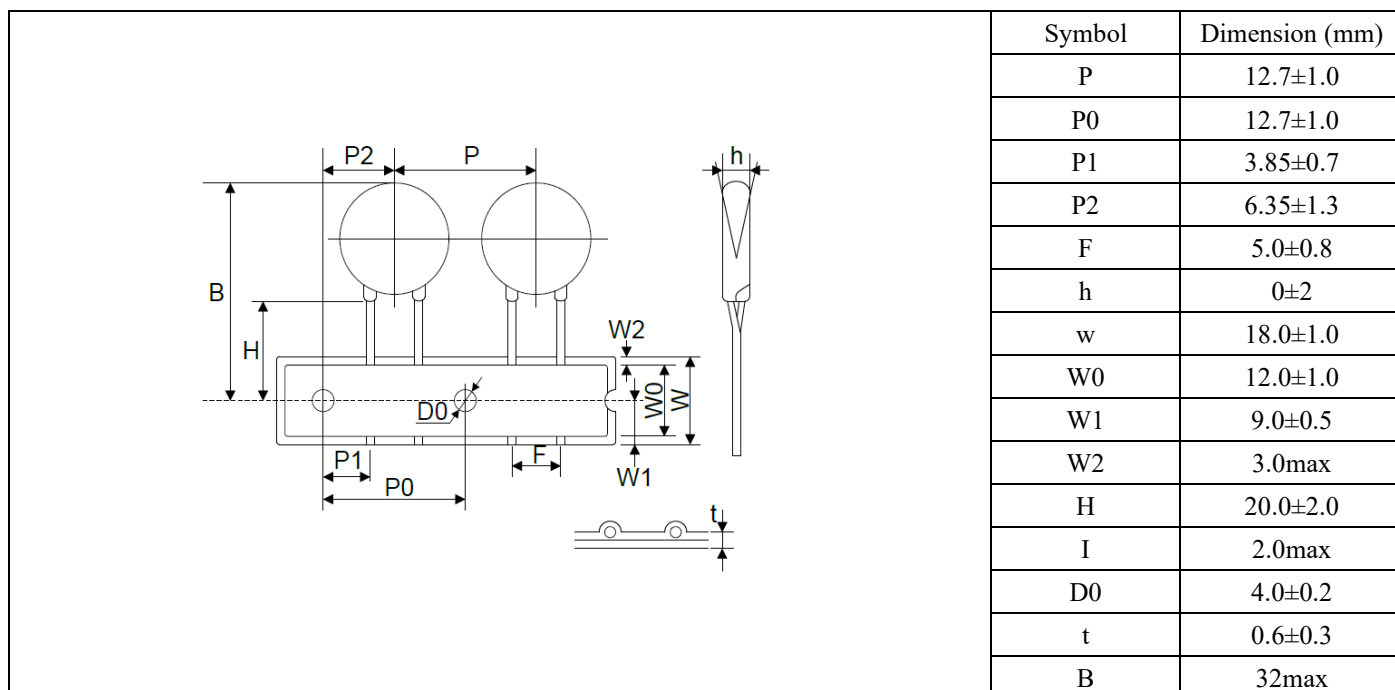
Impulse Lifetime Rating

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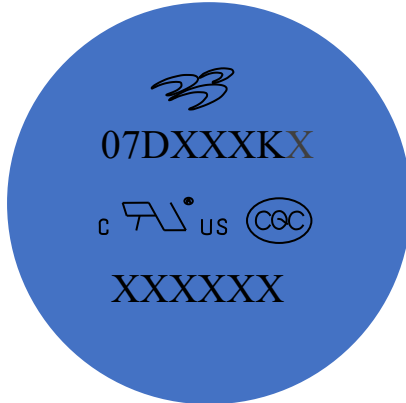




Taping Dimensions



Marking Code


 : Bencent

07: Disk 7mm; **D**:Rotundity; **XXXX**: Varistor Voltage
X:High surge code, no 'X' is standard

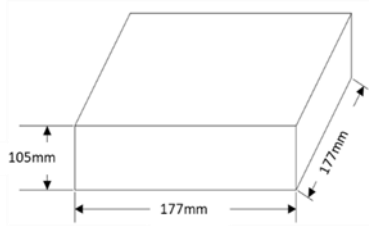
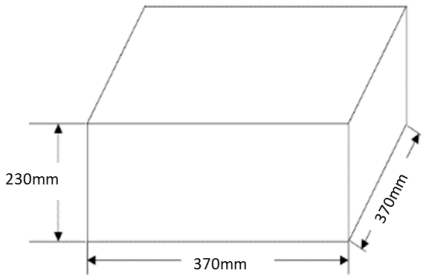
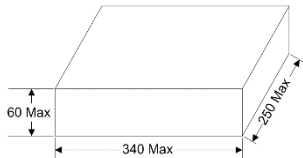
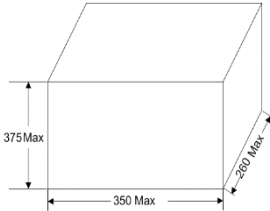
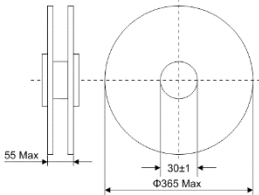
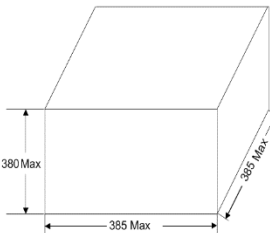
 : UL\CQC Mark

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

XX: Date

Quantity

Packaging Dimensions (Unit: mm)

Inner box size		Outer box size	Quantity	
Bulk			1000pcs/bag 2bags/box (180K~681K)	
			500pcs/bag 2bags/box (751K~821K)	
Tape & Box			1500pcs/box (180K~331K)	
			1500pcs/box (361K~391K)	
			1000pcs/box (431K~511K)	
			1000pcs/box (561K~681K)	
Reel size		Inner box size	Outer box size	Quantity
Tape & Reel				2000pcs/reel (180K~331K)
				1500pcs/reel (361K~391K)
				1500pcs/reel (431K~511K)
				1500pcs/reel (561K~681K)