

**Product Application:**

- \* 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.

**Advantages:**

1. Wide voltage range
2. Large capacitance and energy tolerance
3. High effective nonlinear coefficient
4. Little leakage current
5. Symmetrical volt-ampere characteristic
6. Low residual voltage
7. Fast action
8. No continued flow
9. Excellent voltage ratio
10. Strong surge absorption ability
11. High surge current handling capability
12. Stable voltage inhibition execution ability
13. Excellent material
14. Reliable operation
15. Long service life
16. Wide application
17. Rohs compliant

**Main parameter:**

- \*Operating Temperature: -40 °C ~ +85 °C
- \*Storage Temperature: -40 °C ~ +125 °C
- \*Coating (Epoxy Resin): Flame-Retardant to UL 94 V-0

**Standard for Safety**

*UL 1449	E171541
*UL 1414	E162455
*CSA	182652(LR107230)
*VDE	127031

**Material**

*Coating:	Epoxy Resin
*Electrode:	Silver
	Solder

**Dimension(Unit: mm):**

Items	20D431KSBNL	20D471KSBNL	20D681KSBNL	20D821KSBNL	20D911KSBNL
D (max)	19.5mm	20.0mm	21.0mm	21.5mm	22.0mm
T (max)	5.9mm	6.0mm	7.0mm	7.2mm	7.6mm
F (±1.0)	7.5/10.0mm	10.0mm	10.0mm	10.0mm	10.0mm
H (max)	25.5mm	25.5mm	26.0mm	26.0mm	26.0mm
L(min±1.0)	15.0mm	15.0mm	17.0mm	22.5mm	22.5mm
d(±0.02)	0.8/1.0mm	1.0mm	1.0mm	1.0mm	1.0mm

**ELECTRICAL PARAMETER OF 20D431KSBNL:**

2.1	MAX CONTINUOUS OPERATING VOLTAGE	275	V AC	
		350	V DC	
2.2	VARISTOR VOLTAGE	387~473	(V)	1MA
2.3	RATED WATTAGE	1.00	(W)AND	8/20μs、200A、
			10 <sup>4</sup> TIMES	
2.4	MAX CLAMPING VOLTAGE	710	(V)	8/20μs、100A
2.5	WITHSTANDING SURGE CURRENT	6500	(A) 1 TIME	8/20μS
2.6	MAX ENERGY	196	JOULE	
2.7	TEMPFRATURE COEFFICIENT	0~0.05	%/°C	$\frac{U_{1mA}(25^{\circ}C) - U_{1mA}(85^{\circ}C)}{U_{1mA}(25^{\circ}C)} \times \frac{1}{60} \times 100\%$
2.8	TYPICAL CAPACITNACE (reference)	700	PF	

**ELECTRICAL PARAMETER OF 20D471KSBNL:**

2.1	MAX CONTINUOUS OPERATING VOLTAGE	300	V AC	
		385	V DC	
2.2	VARISTOR VOLTAGE	423~517	(V)	1MA
2.3	RATED WATTAGE	1.00	(W)AND	8/20μs、200A、
			10 <sup>4</sup> TIMES	
2.4	MAX CLAMPING VOLTAGE	775	(V)	8/20μs、100A
2.5	WITHSTANDING SURGE CURRENT	6500	(A) 1 TIME	8/20μS
2.6	MAX ENERGY	220	JOULE	
2.7	TEMPFRATURE COEFFICIENT	0~0.05	%/°C	$\frac{U_{1mA}(25^{\circ}C) - U_{1mA}(85^{\circ}C)}{U_{1mA}(25^{\circ}C)} \times \frac{1}{60} \times 100\%$
2.8	TYPICAI CAPACITNACE (reference)	620	PF	

**ELECTRICAL PARAMETER OF 20D681KSBNL :**

2.1	MAX ALLOWABLE VOLTAGE	420	V AC	
		560	V DC	
2.2	VARISTOR VOLTAGE	612~748	(V)	1MA
2.3	RATED WATTAGE	1.00	(W)AND	8/20μs、200A、
			10 <sup>4</sup> TIMES	
2.4	MAX CLAMPING VOLTAGE	1120	(V)	8/20μs、100A
2.5	WITHSTANDING SURGE CURRENT	6500	(A) 1 TIME	8/20μS
2.6	MAX ENERGY	230	JOULE	10/1000μS
2.7	TEMPERATURE COEFFICIENT	0~0.05	%/°C	$\frac{U_{1mA}(25^{\circ}C) - U_{1mA}(85^{\circ}C)}{U_{1mA}(25^{\circ}C)} \times \frac{1}{60} \times 100\%$
2.8	CAPACITANCE(REFERENCE)	440	PF	Frequency: 1kHz±10%、Signal level≤1VRMS ,Zero-bias

**ELECTRICAL PARAMETER OF 20D821KSBNL :**

2.1	MAX ALLOWABLE VOLTAGE	510	V AC	
		670	V DC	
2.2	VARISTOR VOLTAGE	738~902	(V)	1MA
2.3	RATED WATTAGE	1.00	(W)AND	8/20μs、200A、
			10 <sup>4</sup> TIMES	
2.4	MAX CLAMPING VOLTAGE	1355	(V)	8/20μs、100A
2.5	WITHSTANDING SURGE CURRENT	6500	(A) 1 TIME	8/20μS
2.6	MAX ENERGY	282	JOULE	10/1000μS
2.7	TEMPERATURE COEFFICIENT	0~0.05	%/°C	$\frac{U_{1mA}(25^{\circ}C) - U_{1mA}(85^{\circ}C)}{U_{1mA}(25^{\circ}C)} \times \frac{1}{60} \times 100\%$
2.8	CAPACITANCE(REFERENCE)	390	PF	Frequency: 1kHz±10%、Signal level≤1VRMS ,Zero-bias

**ELECTRICAL PARAMETER OF 20D911KSBNL:**

2.1	MAX ALLOWABLE VOLTAGE	550	V AC	
		745	V DC	
2.2	VARISTOR VOLTAGE	819~1001	(V)	1MA
2.3	RATED WATTAGE	1.00	(W)AND	8/20μs、200A、
			10 <sup>4</sup> TIMES	
2.4	MAX CLAMPING VOLTAGE	1500	(V)	8/20μs、100A
2.5	WITHSTANDING SURGE CURRENT	6500	(A) 1 TIME	8/20μS
2.6	MAX ENERGY	310	JOULE	10/1000μS
2.7	TEMPERATURE COEFFICIENT	0~0.05	%/°C	$\frac{U_{1mA}(25^{\circ}C) - U_{1mA}(85^{\circ}C)}{U_{1mA}(25^{\circ}C)} \times \frac{1}{60} \times 100\%$

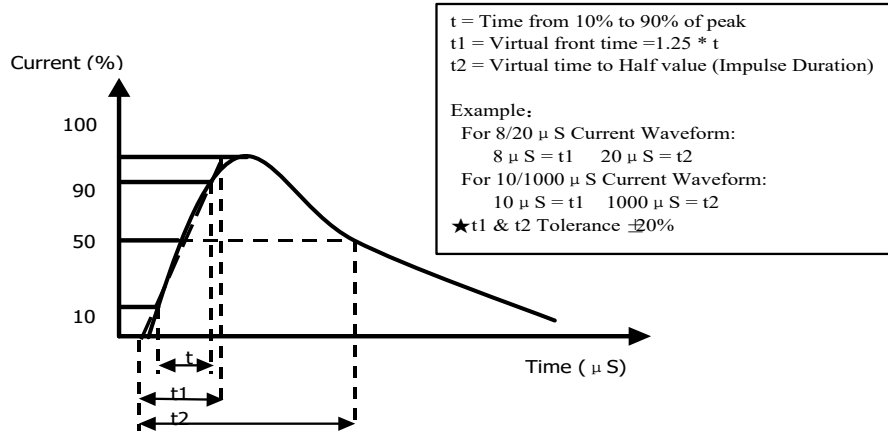


2.8	CAPACITANCE(REFERENCE)	360	PF	Frequency: 1kHz±10%、Signal level≤1VRMS ,Zero-bias
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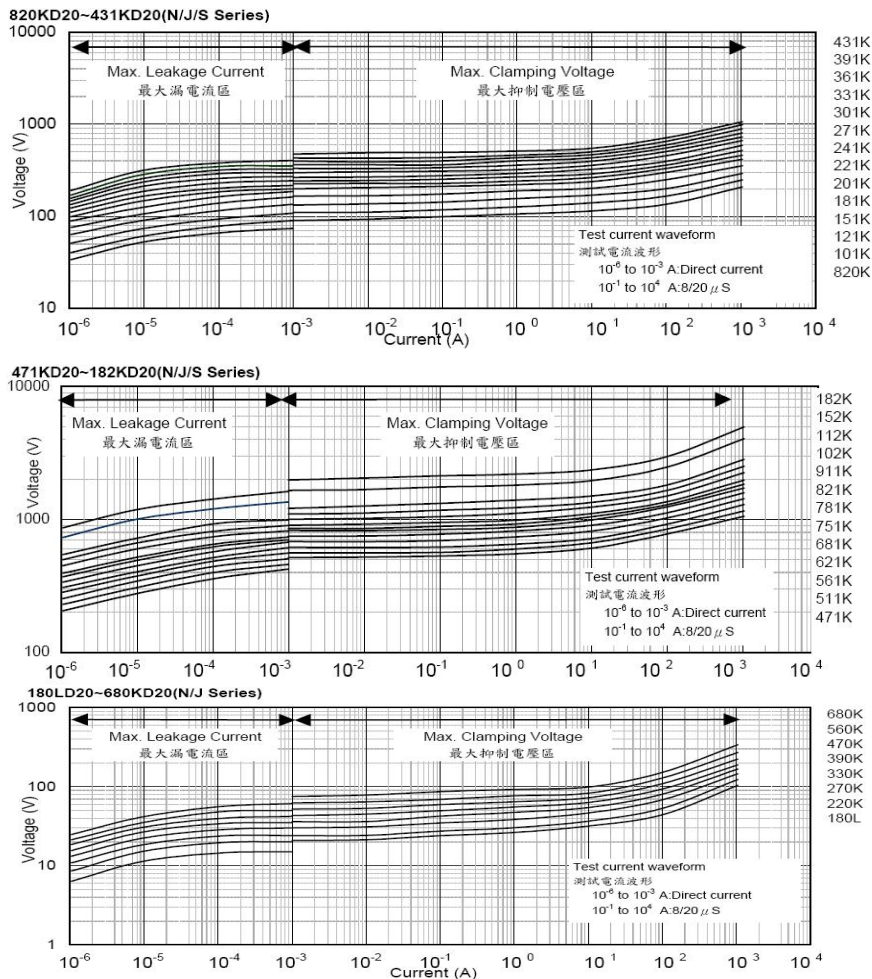
**Maximum Clamping Voltage:**

The maximum voltage between two terminals with the specification standard impulse current.

Applied waveform:8/20μ sec

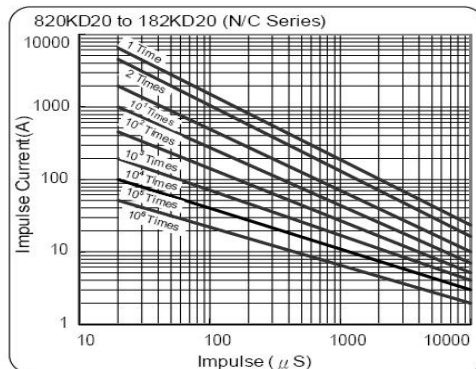
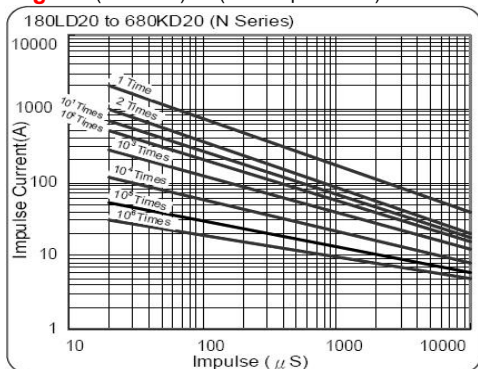


**V-I CURVE:**





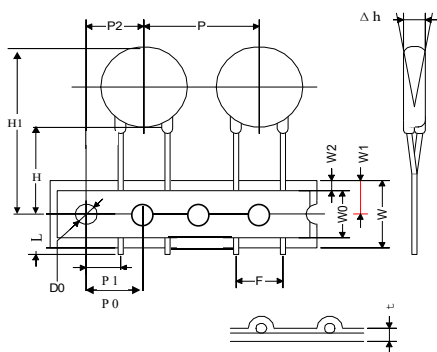
**Surge Life Time Ratings** N (Standard) / K (Low Capacitance) Series



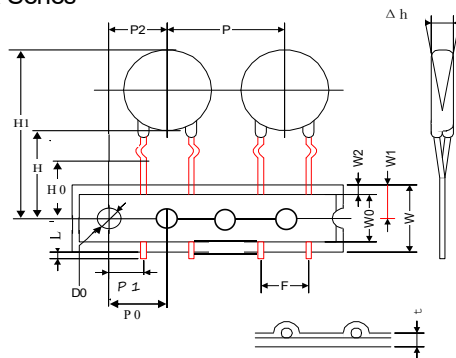
**Packing method:**

**Dimension - SA / SR / CA / CR Ammo & Reel Series**

**SA / SR**



**CA / CR Series**



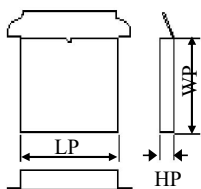
Unit: mm

Symbol	P	P0	P1	P2	F	W	W0	W1
D14	25.4±1.0	12.7±1.0	8.95±0.7	12.7±1.3	7.5±0.5	18.0±1.0	12.5max	9.0±0.5
Symbol	W2	H	H0	H1	Δh	L	D0	t
D14	3.0max.	20.0±2.0	16.0±1.0	40.0max.	0±2	1.0max.	4.0±0.2	0.6±0.3

**Packing Specifications**

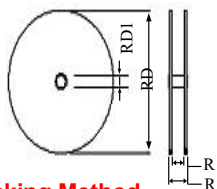
**Ammo & Reel Packing Dimension**

**Ammo & Reel Box**



<b>Symbol</b>	Ammo
<b>LP :</b>	335 mm
<b>WP :</b>	243 mm
<b>HP :</b>	50 mm
<b>Carton :</b>	355 mm * 260 mm * 537 mm

**Reel**



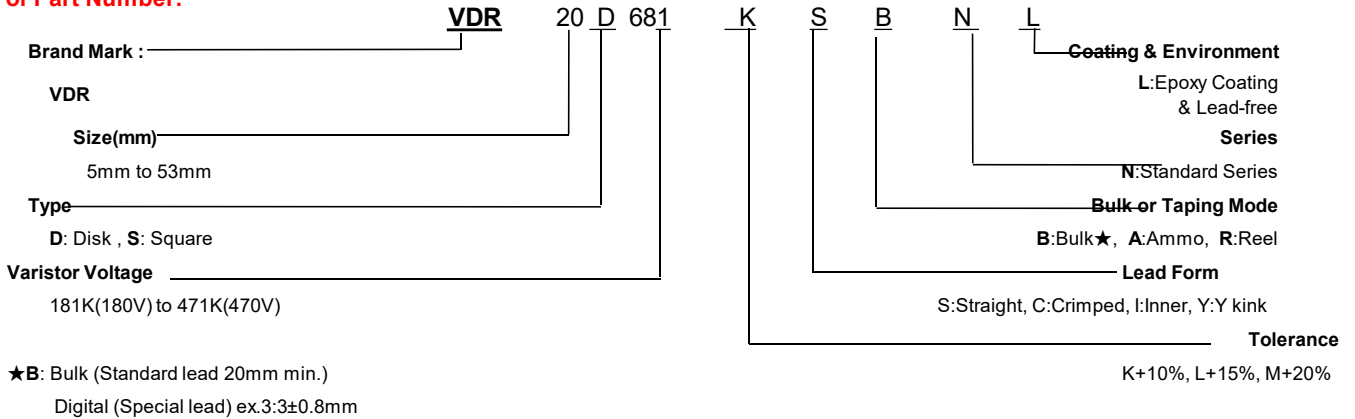
<b>Symbol</b>	Reel
<b>LP :</b>	345mm
<b>WP :</b>	345mm
<b>HP :</b>	65mm
<b>RD :</b>	340 mm
<b>RD1 :</b>	30 ± 0.5 mm
<b>RW :</b>	51mm
<b>RW1 :</b>	56mm
<b>Carton :</b>	360 mm * 360 mm * 480 mm

**Quantity per Packing Method**



Item	Part No.		Bulk			Reel		Ammo	
			Bag	Box	Carton	Box	Carton	Box	Carton
1	05D	8R0M-391K	1000	2000	12000	2000	16000	2000	10000
2		431K-751K						1500	7500
3	07D	8R0M-391K	1000	2000	12000	2000	16000	2000	10000
4		431K-821K						1500	7500
5	10D	All	500	1000	6000	500	3500	500	5000
6	14D	120M-471K	500	1000	6000	500	3500	500	5000
7		511K-182K	250	500	3000	400	2800	500	5000
8	18D	180L-471K	250	500	3000	400	2800	400	3000
9		511K-112K	150	300	2000	300	2500	400	2800
10	20D	180L-471K	250	500	3000	400	2800	400	2800
11		511K-182K	125	250	1500	300	2100	300	2100
12	25D	All	125	250	1500				
13	32D	All	20	80	480				
14	34S	All	15	60	360				
15	40D	All	15	60	360				

Marking of Part Number:



Marking example :

Marking example	Marking description
	VDR-Company Product Code:SHENZHEN DXM TECHNOLOGY CO., LTD. Metal Oxide Varistor,Surge Absorber;
	20D681K \$ 20MM VARISTOR VOLTAGE 680V(±10%)
	UL1449 3rd safety approval                  VDE IEC 60950-1 Annex Q
	Canada safety approval                  GB/T10193-1997 GB/T10194-1997
	Date code:12=year 2012 7=Month 7 CQC11-471551-2009

Specification&part no.:

N(Standard) Series

Element Diameter: 20mm

Item	Part No.	Max Allowable Voltage		Max Clamping Voltage	Varistor Voltage	Energie 10/1000µS (J)	Withstanding Surge Current		Rated Power (W)
		ACrms(V)	DC(V)	at 100A (V)	at 1mA (V)		1 time (A)	2 times (A)	
1	20D182K	1000	1465	2970	1800(1620-1980)	560.0			
2	20D152K	900	1200	2475	1500(1350-1650)	420.0			
3	20D112K	680	895	1815	1100(990-1210)	280.0			
4	20D102K	625	825	1650	1000(900-1100)	280.0			
5	20D911K	550	745	1500	910(819-1001)	280.0			
6	20D821K	510	670	1355	820(738-902)	266.0			
7	20D781K	485	640	1290	780(702-858)	266.0			
8	20D751K	460	615	1240	750(675-825)	266.0			
9	20D681K	420	560	1120	680(612-748)	224.0			
10	20D621K	385	505	1025	620(558-682)	224.0			



11	20D561K	350	460	920	560(504-616)	210.0	6500	4000	1.0
12	20D511K	320	415	845	510(459-561)	210.0			
13	20D471K	300	385	775	470(423-517)	210.0			
14	20D431K	275	350	710	430(387-473)	196.0			
15	20D391K	250	320	650	390(351-429)	182.0			
16	20D361K	230	300	595	360(324-396)	168.0			
17	20D331K	210	275	550	330(297-363)	140.0			
18	20D301K	190	250	505	300(270-330)	133.0			
19	20D271K	175	225	455	270(243-297)	126.0			
20	20D251K	160	205	415	250(225-275)	116.0			
21	20D241K	150	200	395	240(216-264)	112.0			
22	20D221K	140	180	360	220(198-242)	105.0			
23	20D201K	130	170	330	200(185-225)	98.0			
24	20D181K	115	150	300	180(162-198)	84.0			
25	20D151K	95	125	250	150(135-165)	70.0			
26	20D121K	75	100	200	120(108-132)	56.0			
27	20D101K	60	85	165	100(90-110)	42.0			
28	20D820K	50	65	135	82(74-90)	37.8			
29	20D680K	40	56	135	68(61-75)	23.8			
30	20D560K	35	45	110	65(50-62)	19.6			
31	20D470K	30	38	93	47(42-52)	16.8			
32	20D390K	25	31	77	39(35-43)	13.2			
33	20D330K	20	26	65	33(30-36)	11.2			
34	20D270K	17	22	53	27(24-30)	9.1			
35	20D220K	14	18	43	22(20-24)	7.4			
36	20D180L	10	14	38	18(15-21)	6.1			

### Terminology Definitions

Technical Term	Descriptions		
Varistor Voltage (Vb)	Voltage across the varistor measured at a specified current (1mA or 0.1mA)		
Maximum Clamping Voltage	Peak voltage across the varistor with a specified peak impulse current (8x20 msec). Waveform see fig. 1		
Maximum Allowable/ Rated Voltage	Maximum sine wave voltage (rms) or the maximum dc voltage which may be applied continuously		
Non-linear Exponent (α)	A measure of varistor voltage-current nonlinearity between two given operating currents, I1 and I2, as described by $I=KV^\alpha$ , where K is a device constant, and $\alpha = \log(I1/I2) / \log(V1/V2)$		
Leakage Current	Maximum current with rated voltage (80% varistor voltage) applied. 200 μA maximum.		
Single Pulse Transient Energy	Energy which may be dissipated for a single 10/1000 μS pulse of a maximum rated current, with AC/DC voltage applied, without causing device failure. <b>Energy=K*Vc*Ip*T</b> Where Ip(Ipeak) is the peak current applied, Vc(Vclamp) is the clamp voltage which results, T is the impulse duration and K is a constant (1.4 for 10/1000 μS waveform). Waveform see fig. 1		
Withstanding Surge Current	The maximum current within the varistor voltage change of ±10% with the standard impulse current (8/20;sec.) applied one time.		
Energy	The maximum energy within the varistor voltage change of ±10% when one impulse is applied. <b>Energy=K*Vc*Ip*T</b> Where Ip(Ipeak) is the peak current Applied, Vc(Vclamp) is the clamp voltage which results, T is the impulse duration and K is a constant.		
Rated Wattage	The maximum average power that can be applied within the specified ambient temperature.		
Varistor Voltage Temperature Coefficient	$\frac{V_b \text{ at } 25^\circ\text{C} - V_b \text{ at } 85^\circ\text{C}}{V_b \text{ at } 25^\circ\text{C}} * \frac{1}{60} * 100\% \quad (+0.05\%/^\circ\text{C max.)}$		
Surge Life Time Rating	The change of Vb that measured after 10,000 times pulses applied continuously with the interval of ten seconds at room temperature. Waveform see fig. 1		
	5D Series	05D120M to 05D680	5A (8/20 μS)
		05D820K to 05D681K	20A (8/20 μS)
	7D Series	07D120M to 07D680K	20A (8/20 μS)
		07D820K to 07D821K	50A (8/20 μS)
	10D Series	10D120M to 10D680K	50A (8/20 μS)
	10D820K to 10D112K	100A (8/20 μS)	
14D Series	14D120M to 14D680K	75A (8/20 μS)	
	14D820K to 14D112K	150A (8/20 μS)	



	20D Series	20D120M to 20D680K	125A (8/20 μ S)
		20D820K to 20D112K	200A (8/20 μ S)

**Reliability Test**

**Mechanical Ratings**

Test Parameter	Test Condition / Description			Performance Requirements
Terminal Pull Strength	After gradually applying the load specified below and keeping the unit fixed for ten seconds, the terminal shall be visually examined for any damage.	Diameter	Loading	No visible damage
		0.6mm	1.0 Kg	
		0.8mm	1.0 Kg	
		1.0mm	2.0 Kg	
Terminal Bending Strength	The unit shall be secured with its terminal kept vertical and the weight specified below be applied in the axial direction. The terminal shall gradually be bent by 90° in one direction, then 90° in the opposite direction, and again back to the original position. The damage of the terminal shall be visually examined.	Diameter	Loading	No visible damage
		0.6mm	0.5 Kg	
		0.8mm	0.5 Kg	
		1.0mm	1.0 Kg	
Vibration	The Specimen shall be vibrated by its lead wires with a total amplitude of 1.5mm and a varying frequency of 10~55~10HZ(each minutes) for a period of 2 hours respectively in each X,Yand Z directions.			No visible damage ΔVB/VB% ≤ ±5%
Soldering-solderability	After dipping the terminal to depth of approximately 3mm from the specimen in a soldering bath of 260°C for 10±1(D5: 5±1) seconds. Thereafter the terminal shall be visually examined.			Terminations shall be uniformly tinned
Soldering- Resistance to Solder Heat	After preheating the specimen, the specimen shall be completely immersed into a soldering bath having a temperature of 260±5°C for 10±1 (D5: 5±1) seconds or iron of 400±5°C for 3±0.5 seconds. There after the change of Vb and mechanical damage shall be examined.			No visible damage ΔVB/VB% ≤ ±5%

**ENVIRONMENTAL RATINGS**

Dry Heat Loading	The specimen shall be applied continuously the maximum allowable voltage at the specified conditions for specified period and then stored at room temperature and normal humidity over 2 hours. Thereafter, the change of Vb and mechanical damage shall be examined. Ambient temp: 125±2°C ; Period: 1000±24hours.			ΔVB/VB% ≤ ±10%
High Temperature Storage	In a drying oven without load. Ambient temp: 125±2°C ; period: 1000±24hours			ΔVB/VB% ≤ ±5%
Damp Heat Loading	The specimen shall be applied continuously the maximum allowable voltage at the specified conditions for specified period and then stored at room temperature and normal humidity over 2 hours. Thereafter, the change of Vb and mechanical damage shall be examined. Ambient condition: 40±2°C , 90 to 95%R.H. ; period: 1000±24 hours			ΔVB/VB% ≤ ±10%
Temperature Cycle	Condition the specimen to each temperature form step 1 to step 4 in this order for the period shown in the table of specifications. The change of Vb and mechanical damage shall be examined after 2 hours.	Step	Temp°C	Period
		1	-40±3°C	30 min.
		2	Room Temp	15 min.
		3	85±2°C	30 min.
4	Room Temp	15 min.	No visible damage ΔVB/VB% ≤ ±10%	
Surge Lifetime Rating	The change of Vb shall be measured after the impulse listed below is applied 10,000 times continuously with the interval of ten seconds at room temperature.			No visible damage ΔVB/VB% ≤ ±10%
Voltage Proof	Voltage: 2500VAC Leakage Current ≤ 0.5mA Time: 60 Seconds			No Breakdown