

THINKING ELECTRONIC INDUSTRIAL CO., LTD.

HEAD OFFICE: 8F-1, No.93, Ta-Shun 1st Rd., Kaohsiung, Taiwan
 TEL: 886-7-5577660 FAX: 886-7-5570560

MANUFACTURING SITE

- KAOHSIUNG FACTORY: No.51, Kaifa Road, Nantze Export Processing Zone,
 Kaohsiung City 81170, Taiwan
 TEL: 886-7-9616668 FAX: 886-7-9616698
- CHANGZHOU FACTORY: No.6 Longmen Road, Wujin National High&New-Tech Industrial
 Development Zone, ChangZhou, JiangSu, China
 TEL: 86-519-86578999 FAX: 86-519-86558643
- DONG GUAN FACTORY: Chiao-Tou Tsun, Sha-Tao Hsiang, Chang-An Town,
 Dong-Guan City 523863, Guangdong, China
 TEL: 86-769-85542016 FAX: 86-769-85546890
- YICHANG FACTORY: No. 283 Xiaoting Avenue, Xiaoting Dist., Yichang
 City 443007, Hubei, China
 TEL: 86-717-6510010 FAX: 86-717-6511430



SPECIFICATION FOR APPROVAL

CUSTOMER

CERTIFIED
 MODEL/TYPE

TVR10471-D

PART NO.

TVR10471BSK(RoHS+HF)

APPLICATION

CUSTOMER P/N

ISSUE DATE

Sep.25.2017

REV. NO.

REV. DATE

FOR CUSTOMER APPROVAL	CHECKED BY
	<i>Yuan Yuan</i>
	APPROVED BY
	<i>Huaifang Zhang</i>





REVISED RECORD SHEET

REV. NO	REV. DATE	REVISED CONTENT



INDEX	Page
■ Part Number Code	1
■ Structure and Dimensions	2
■ Electrical Characteristics	2
■ Reliability	3 ~ 4
■ Soldering Recommendation	5
■ Power Derating Curve	6
■ RoHS Compliant Declaration	6
■ Warehouse Storage Conditions of Products	6
■ Safety Approvals	7
■ Certificates	7
■ Max. Surge Current Derating Curves	8
■ Max. Leakage Current and Max. Clamping Voltage Curve	9

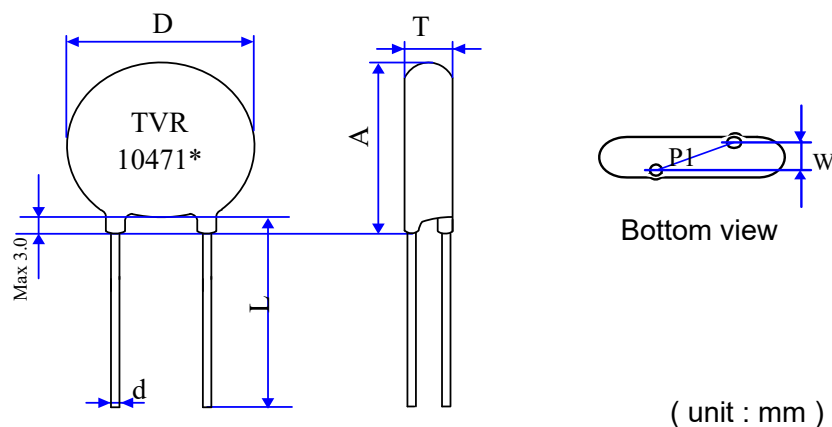
Part Number Code

Example :

TVR **10** **471** **B** **S** **K**
 (1) (2) (3) (4) (5) (6)

No.	Item	Digit	Specification
(1)	Product Type	TVR	Thinking varistor TVR type
(2)	Body Size	10	φ 10 mm
(3)	Varistor Voltage	471	$47 \times 10^1 \text{ V} = 470\text{V} (V_{1\text{mA}})$
(4)	Tolerance of $V_{1\text{mA}}$	B	-10%~0
(5)	Appearance	S	Straight lead , epoxy coating
(7)	Optional Suffix	K	RoHS+HF compliance &High surge series

Structure and Dimensions



Body Size	D	P 1	d	A max.	L min.	T	W
φ 10D	12.0~14.0	7.5±0.5	0.8±0.02	17.5	26.5	3.6~5.6	2.6±1.0

*Coating material rating:UL 94 V-0

Electrical Characteristics (Ambient Ta=25 °C)

Part No.	Varistor Voltage (@ 1mA DC)	Max. Continuous Voltage		Max. Clamping Voltage (8/20μS)		Max. Surge Current (8/20μS)	Max. Energy (10/1000μS)
	V _{1mA} (V)	V _{AC(rms)} (V)	V _{DC} (V)	V _p (V)	I _p (A)	I (A)	W (J)
TVR10471BSK	423~470	300	385	775	25	4000	99

Part No.	Rated Power	Impulse Response Time	Max. Leakage Current at 75%V _{1mA}	Operating Temperature Range	Storage temperature Range	Applications		
	P (W)	nSec	I _L (μA)	(°C)	(°C)	UL1449	IEC60950-1	IEC60065
TVR10471BSK	0.4	<25	20	-40 ~ +85	-40 ~ +125	SPD Type 5	Annex Q	Clause 14.12

Reliability

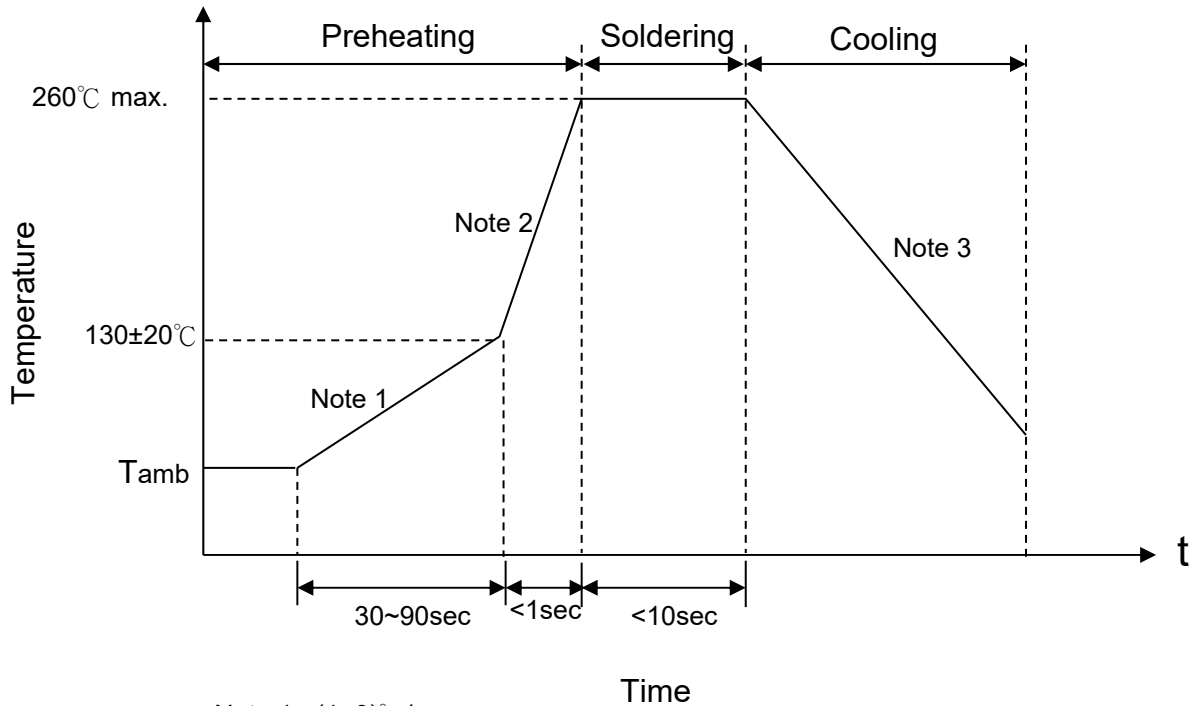
Item	Standard	Test conditions / Methods	Specifications															
Tensile Strength of Terminals	IEC60068-2-21	Gradually applying the force specified and keeping the unit fixed for 10±1 sec. <table style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;">Terminal diameter (mm)</td> <td style="text-align: center;">Force (Kg)</td> </tr> <tr> <td style="text-align: center;">0.5<d≤0.8</td> <td style="text-align: center;">1.0</td> </tr> <tr> <td style="text-align: center;">0.8<d≤1.25</td> <td style="text-align: center;">2.0</td> </tr> <tr> <td style="text-align: center;">1.25<d</td> <td style="text-align: center;">4.0</td> </tr> </table>	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 $\Delta V/V_{1mA}$ ≤5%							
Terminal diameter (mm)	Force (Kg)																	
0.5<d≤0.8	1.0																	
0.8<d≤1.25	2.0																	
1.25<d	4.0																	
Bending Strength of Terminals	IEC60068-2-21	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 style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;">Terminal diameter (mm)</td> <td style="text-align: center;">Force (Kg)</td> </tr> <tr> <td style="text-align: center;">0.5<d≤0.8</td> <td style="text-align: center;">0.5</td> </tr> <tr> <td style="text-align: center;">0.8<d≤1.25</td> <td style="text-align: center;">1.0</td> </tr> <tr> <td style="text-align: center;">1.25<d</td> <td style="text-align: center;">2.0</td> </tr> </table>	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 $\Delta V/V_{1mA}$ ≤5%							
Terminal diameter (mm)	Force (Kg)																	
0.5<d≤0.8	0.5																	
0.8<d≤1.25	1.0																	
1.25<d	2.0																	
Vibration	IEC 60068-2-6	Frequency range:10~55Hz Amplitude:0.75mm or 98m/S ² Direction:3 mutually perpendicular directions,2hrs each.	$\Delta V/V_{1mA}$ ≤5% No visible damage															
Solderability	IEC60068-2-20	245 ± 3 °C , 3 ± 0.3 sec	At least 95% of terminal electrode is covered by new solder															
Resistance to Soldering Heat	IEC60068-2-20	260 ± 3 °C , 10 ± 1 sec	No visible damage $\Delta V/V_{1mA}$ ≤5%															
High Temperature Storage	IEC60068-2-2	125 ± 5 °C , 1000 ± 24 hrs	No visible damage $\Delta V/V_{1mA}$ ≤5%															
Damp Heat, Steady State	IEC 60068-2-78	The test is divided into two groups . a.40 ± 2°C , 90 ~ 95 % RH , 1344 hrs b.40 ± 2°C , 90 ~ 95 % RH , at 10%V _{DC} , 1344 hrs	No visible damage $\Delta V/V_{1mA}$ ≤10% Insulation Resistance ≥ 100MΩ															
Rapid Change of Temperature	IEC60068-2-14	The conditions shown below shall be repeated 5 cycles <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Step</th> <th>Temperature (°C)</th> <th>Period (minutes)</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">-40 ± 3</td> <td style="text-align: center;">30 ± 3</td> </tr> <tr> <td style="text-align: center;">2</td> <td style="text-align: center;">Room temperature</td> <td style="text-align: center;">5 ± 3</td> </tr> <tr> <td style="text-align: center;">3</td> <td style="text-align: center;">85 ± 2</td> <td style="text-align: center;">30 ± 3</td> </tr> <tr> <td style="text-align: center;">4</td> <td style="text-align: center;">Room temperature</td> <td style="text-align: center;">5 ± 3</td> </tr> </tbody> </table>	Step	Temperature (°C)	Period (minutes)	1	-40 ± 3	30 ± 3	2	Room temperature	5 ± 3	3	85 ± 2	30 ± 3	4	Room temperature	5 ± 3	No visible damage $\Delta V/V_{1mA}$ ≤5%
Step	Temperature (°C)	Period (minutes)																
1	-40 ± 3	30 ± 3																
2	Room temperature	5 ± 3																
3	85 ± 2	30 ± 3																
4	Room temperature	5 ± 3																
High Temp. Load	MIL-STD-202 Method 108	85 ± 2 °C , 1000 ± 24 hrs, at V _{DC} or V _{rms} (Max. Operating Voltage)	$\Delta V/V_{1mA}$ ≤10% No visible damage															



Item	Standard	Test conditions / Methods	Specifications
8/20 μ S Surge Life	IEC 61051-1 4.6	10,000 pulses(8/20 μ S) , unipolar, interval 10 secs, amplitude corr. to max. Surge current derating curves for 20 μ S	$ \Delta V/V_{1mA} \leq 10\%$ No visible damage
10/1000 μ S Surge Life	IEC 61051-1 4.6	10/1000 μ S waveform, 10 surge currents, unipolar, interval 2mins, amplitude corr. to max. surge current derating curves for 1000 μ S	$ \Delta V/V_{1mA} \leq 10\%$ No visible damage
Varistor Voltage Temp. Coefficient	Specification Standard	$\frac{V_{1mA} \text{ at } 85^{\circ}\text{C} - V_{1mA} \text{ at } 25^{\circ}\text{C}}{V_{1mA} \text{ at } 25^{\circ}\text{C}} \times \frac{1}{60} \times 100 (\% / ^{\circ}\text{C})$ $\frac{V_{1mA} \text{ at } -40^{\circ}\text{C} - V_{1mA} \text{ at } 25^{\circ}\text{C}}{V_{1mA} \text{ at } 25^{\circ}\text{C}} \times \frac{1}{65} \times 100 (\% / ^{\circ}\text{C})$	$-0.05 \leq TC \leq 0.05 (\% / ^{\circ}\text{C})$
Voltage Proof	IEC 61051-1 4.9	Metal balls method, 2500 Vac 1 min	No visible damage

Soldering Recommendation

Wave Soldering Profile



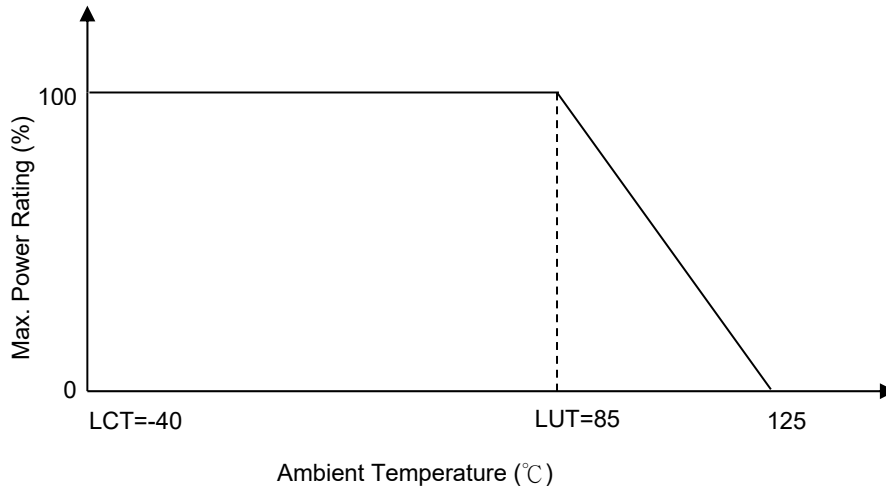
- Note 1 : $(1\sim3)^{\circ}\text{C}/\text{sec}$
 Note 2 : Approx. $200^{\circ}\text{C}/\text{sec}$
 Note 3 : $5^{\circ}\text{C}/\text{sec}$ Max

Recommended Reworking Conditions with Soldering Iron

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

Power Derating Curve

When operating temperature exceeds 85°C, the power, the Max.continuous operation Voltage, the Max.Surge Current and the Max.Energy should be derated as below figure, the derated coefficient is -2.5%.



RoHS Compliant Declaration

We hereby declare that the components delivered to your company are compliant with RoHS directive 2011/65/EU

Warehouse Storage Conditions of Products

(I) Storage Conditions :

- 1.Storage Temperature : -10°C~+40°C
- 2.Relative Humidity : $\leq 75\%RH$
- 3.Keep away from corrosive atmosphere and sunlight.

(II) Period of Storage : 1 year

Safety Approvals (Certified Model/Type :TVR10471-D)

- * UL 1449/ cUL recognized (File # 4th E314979)
- UL1449 (file number E314979) for use in SPD Type 5
- Meet the surge requirements 6KV/3KA combination wave of IEC 60950-1 Annex Q and IEC 60065 14.12



- * VDE IEC 61051-1:2007-04 / IEC 61051-2:1991
- IEC 61051-2-2:1991/IEC 60950-1:2013 Annex Q recognized (File # 40021243)



- * CQC GB/T10193-1997 ` GB/T10194-1997 recognized
(File # CQC10001041750/CQC10001041751)

Certificates

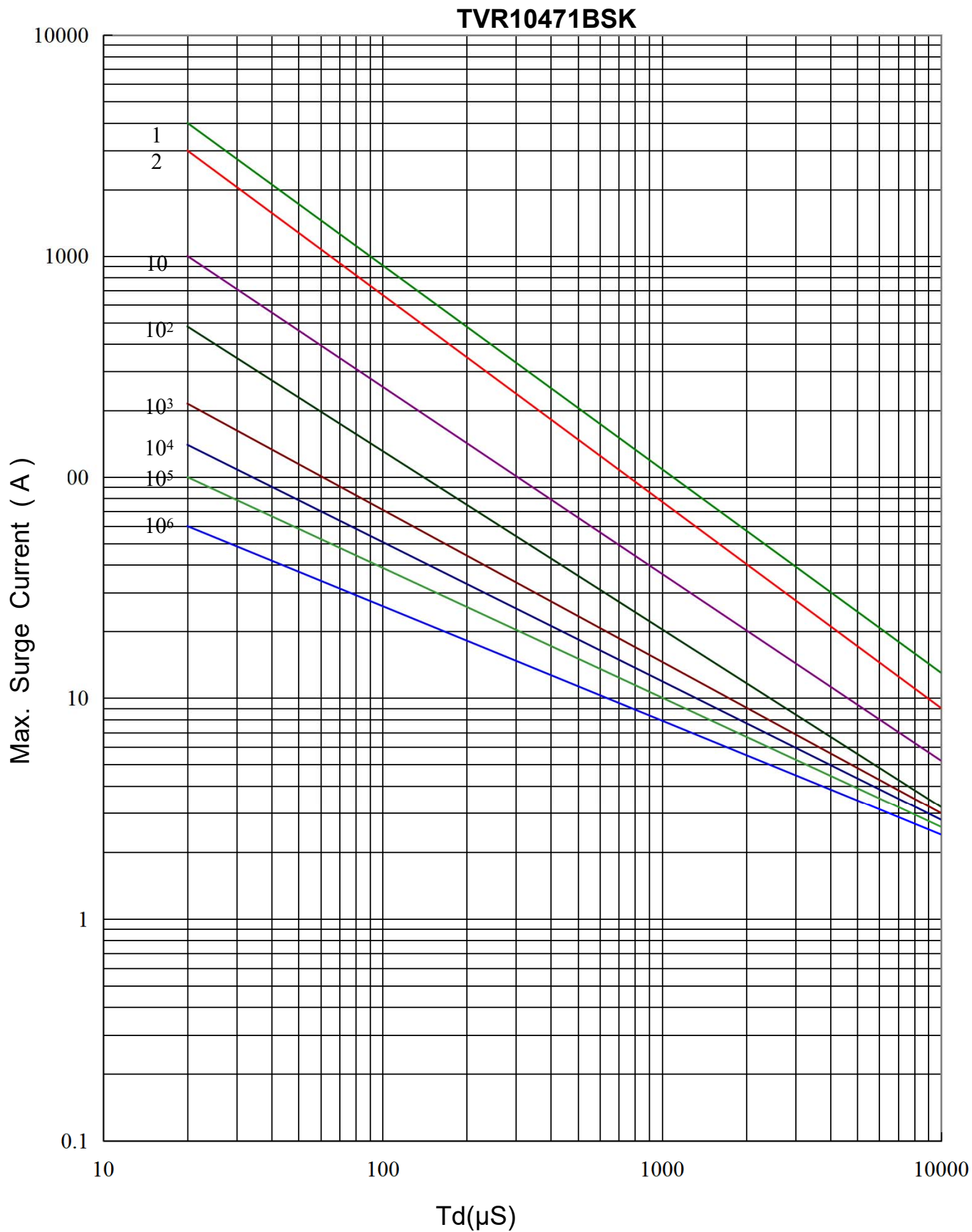
- (1) TS 16949 certificate
- (2) ISO 9001 certificate

Test Report

- (1) RoHS test report
- (2) Halogen-free test report



Max. Surge Current Derating Curves





Max. Leakage Current and Max. Clamping Voltage Curve

