



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: Wujin High & New Tech Ind. Development Zone, Hutang, Wujin, Changzhou City 213161, 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

TVR14511

PART NO.

TVR14511KFRBF1F(RoHS+HF)

APPLICATION _____

CUSTOMER P/N _____

ISSUE DATE

Sep.13.2011

REV. NO _____

REV. DATE _____

FOR CUSTOMER APPROVAL	CHECKED BY
	Tiantian Liu
	APPROVED BY
	Huaifang Zhang





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
■ Storage Conditions of Products	6
■ Taping and Dimensions	7
■ Packaging	8
■ Safety Approvals	9
■ Certificates	9
■ Max. Surge Current Derating Curves	10
■ Max. Leakage Current and Max. Clamping Voltage Curve	11

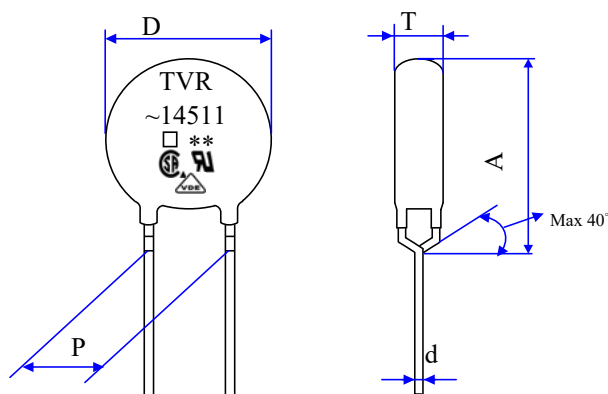
Part Number Code

Example :

TVR **14** **511** **K** **F** **RB** **F1F**
 (1) (2) (3) (4) (5) (6) (7)

No.	Item	Digit	Specification
(1)	Product Type	TVR	Thinking varistor TVR type
(2)	Body Size	14	φ 14 mm
(3)	Varistor Voltage	511	Refer to "Optional Suffix"
(4)	Tolerance of V_{1mA}	K	Refer to "Optional Suffix"
(5)	Appearance	F	Y Kink Lead, Epoxy Coating
(6)	Packaging	RB	Tape (hole pitch: 12.7mm) & box
(7)	Optional Suffix	F1F	1. V_{1mA} : 453~553V 2. Max. Operating Voltage(V_{DC}): 420V 3. Marking the production date code (Such as: " ***" , " " is "year" code , "****" is "weeks" code) and UL CSA VDE on the body 4. RoHS+HF compliance

Structure and Dimensions



(unit : mm)

Body Size	D max.	P	d	A max.	T max.
φ 14	16.0	7.5±0.5	0.80±0.02	19.0	5.8

Electrical Characteristics (Ambient $T_a=25^{\circ}\text{C}$)

Part No.	Varistor Voltage (@ 1mA DC)	Max. Operating 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)
TVR14511KFRBF1F	453~553	320	420	845	50	4500	125

Part No.	Rated Power	Impulse Response Time	Max. Leakage Current at 75% V_{1mA}	*Reference Capacitance @1KHZ	Operating Temperature	Storage Temperature	Applications		
	P (W)	nSec	$I_L(\mu A)$	C (pF)	($^{\circ}\text{C}$)	($^{\circ}\text{C}$)	UL 1449	IEC 60950-1	IEC 60065
TVR14511KFRBF1F	0.6	<50	20	290	-40 ~ +85	-55 ~ +125	SPD Type 3	Annex Q	Clause 14.12

*Capacitance values are not subject to outgoing inspection.

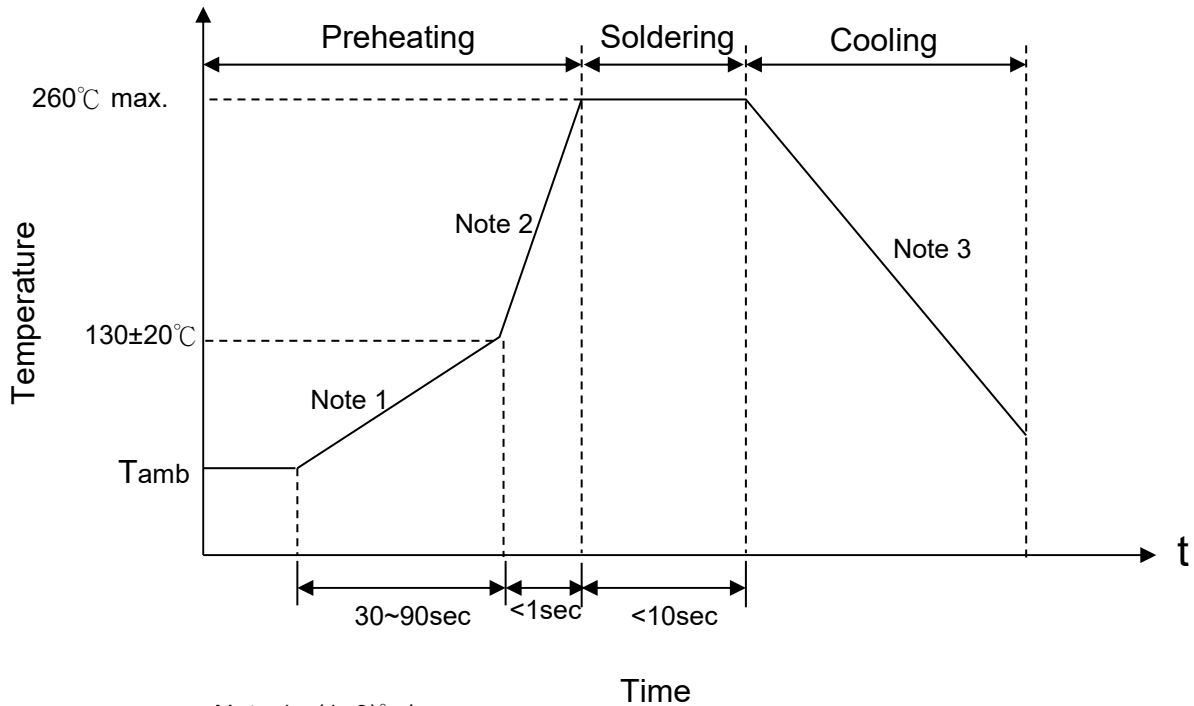
Reliability

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 ΔV/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 ΔV/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 1051-1	Frequency range:10~55Hz Amplitude:0.75mm or 98m/S ² Direction:3 mutually perpendicular directions,2hrs each.	ΔV/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 ΔV/V _{1mA} ≤5%															
High Temperature Storage	IEC60068-2-2	125 ± 5 °C , 1000 ± 24 hrs	No visible damage ΔV/V _{1mA} ≤5%															
Damp Heat, Steady State	IEC60068-2-3	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 ΔV/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 ΔV/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																
Endurance at Upper Category Temperature	IEC61051-4.20	85 ± 2 °C , 1000 ± 24 hrs, at V _{DC} or V _{rms} (Max. Operating Voltage)	ΔV/V _{1mA} ≤10% No visible damage															

Item	Standard	Test conditions / Methods	Specifications
Low Temperature Storage (Optional)	CECC42000	-55 ± 5 °C, 1000 ± 24 hrs	$ \Delta V/V_{1mA} \leq 5\%$ No visible damage
8/20μS Surge Life	CECC42000	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
10/1000μS Surge Life	CECC42000	10/1000μS waveform, 10 surge currents,unipolar,interval 2mins, amplitude corr. to max. surge current derating curves for 1000μS	$ \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 ≤ TC ≤ 0.05(%/°C)
Voltage Proof	IEC61051-4.8	Metal balls method, 2500 Vac 1 min	No visible damage

Soldering Recommendation

■ Wave Soldering Profile



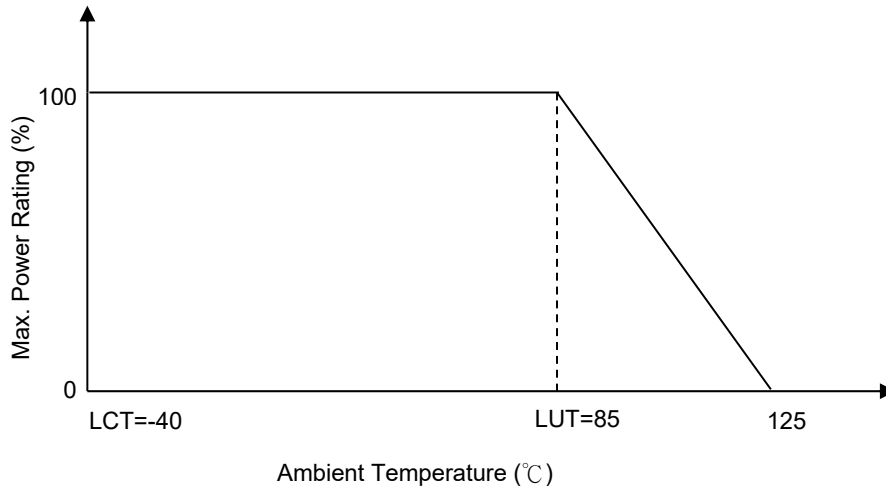
- Note 1 : $(1\sim 3)^\circ\text{C/sec}$
 Note 2 : Approx. 200°C/sec
 Note 3 : 5°C/sec Max

■ 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 2002/95/EC

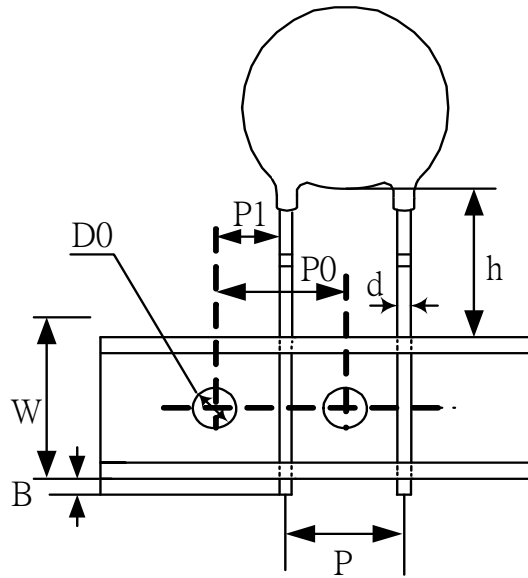
Storage Conditions of Products

(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

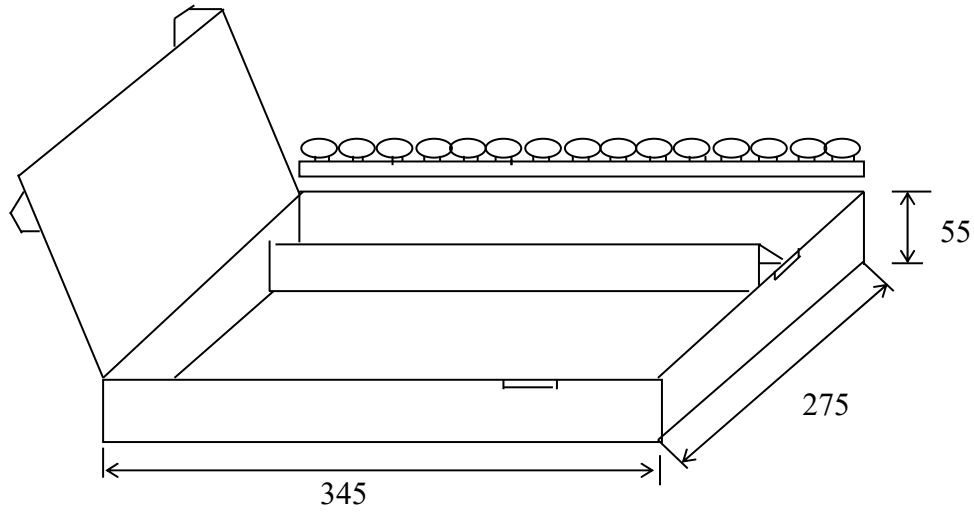
Taping and Dimensions



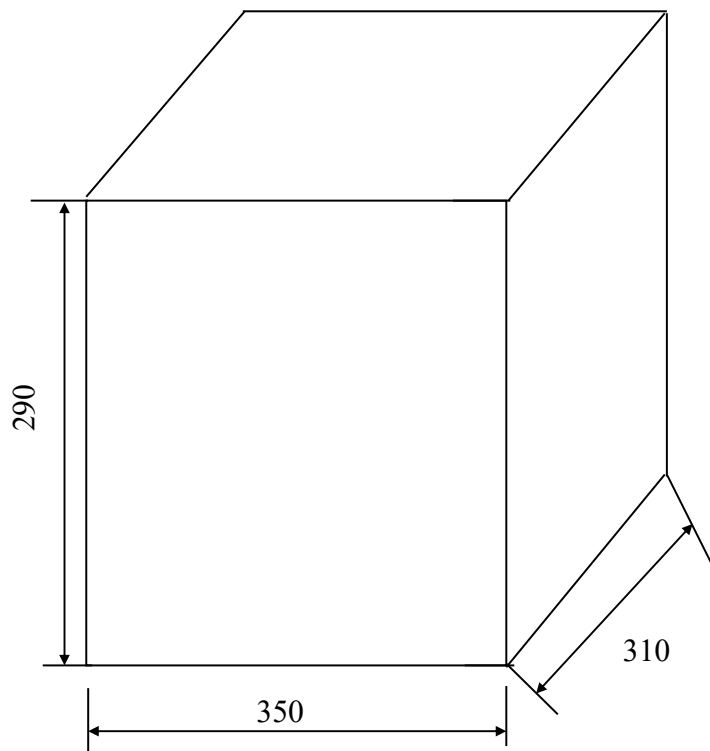
ITEM.	P	P0	P1	h	W	B	d	D0
Nor.	7.5	12.7	8.55	16.5	18	1	0.8	4
ToL.	±0.5	±1	±1	±1	±1	max	±0.02	±0.02

Packaging

(1) Inner Box (500pcs/box)



(2) Outer Box (5 Boxes /Carton)



(Unit:mm)

Safety Approvals (Certified Model/Type :TVR14511)

- * UL 1449 3rd / cUL recognized (File # E314979)
- * UL 1414 / cUL recognized (File # E186499)
- UL1449 (file number E314979) for use in SPD Type 3
- 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 recognized (File # 5944)



- * CQC GB/T10193-1997 ` GB/T10194-1997 recognized
(File # CQC03001005165/CQC03001007654)

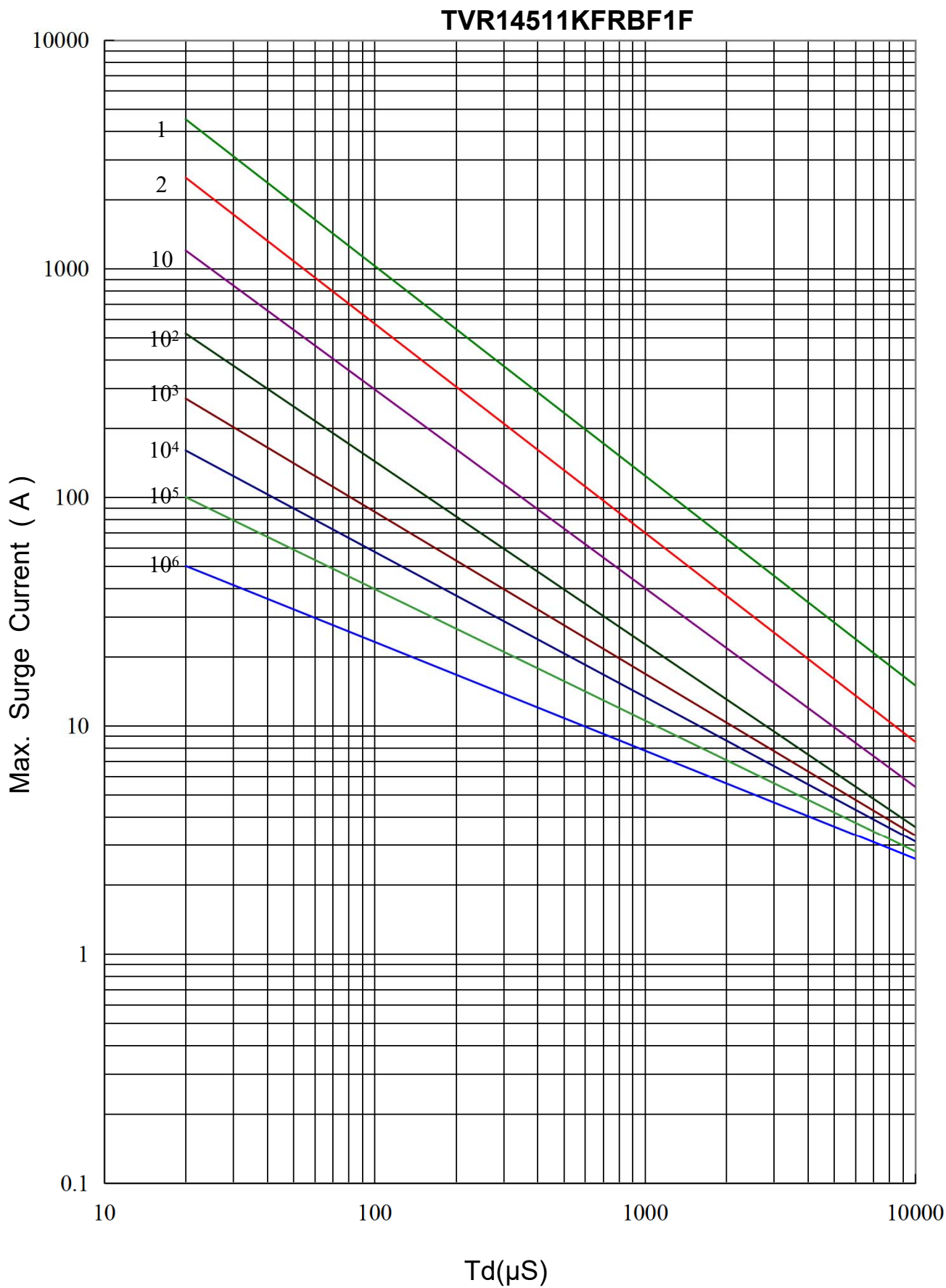
Certificates

- (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

