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SPECIFICATION FOR APPROVAL

CUSTOMER _____

CERTIFIED MODEL/TYPE TVR07471

PART NO. TVR07471KOY (RoHS)

APPLICATION _____

CUSTOMER P/N _____

ISSUE DATE Apr.04.2019

REV. NO. _____

REV. DATE _____

| FOR CUSTOMER APPROVAL | CHECKED BY |
|-----------------------|----------------|
| | Yuan Yuan |
| | APPROVED BY |
| | Huaifang Zhang |





Zinc Oxide Varistor TVR Type
Part No. :TVR07471KOY

REVISED RECORD SHEET

| REV. NO | REV. DATE | REVISED CONTENT |
|---------|-----------|-----------------|
| | | |



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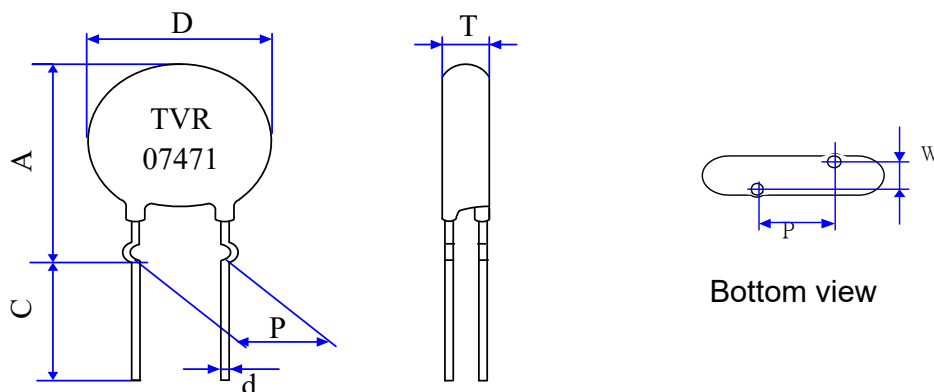
Part Number Code

Example :

TVR **07** **471** **K** **O** **Y**
(1) **(2)** **(3)** **(4)** **(5)** **(6)**

| No. | Item | Digit | Specification |
|-----|-------------------------------|-------|---|
| (1) | Product Type | TVR | Thinking varistor TVR type |
| (2) | Body Size | 07 | φ 07 mm |
| (3) | Varistor Voltage | 471 | $47 \times 10^1 \text{ V} = 470\text{V} (V_{1\text{mA}})$ |
| (4) | Tolerance of $V_{1\text{mA}}$ | K | ±10% |
| (5) | Appearance | O | Kink -out Lead ; Epoxy Coating |
| (6) | Optional Suffix | Y | RoHS compliance |

Structure and Dimensions



(unit : mm)

| Body Size | D | P | d | A max. | C min. | T | W |
|-----------|---------|---------|----------|--------|--------|---------|---------|
| $\phi 07$ | 6.5~9.0 | 5.0±0.5 | 0.6±0.02 | 14.5 | 20 | 3.2-5.2 | 2.4±1.0 |

*Coating material rating:UL 94 V-0

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

| Part No. | Varistor Voltage (@ 1mA DC) | Max. Continuous Voltage | | Max. Clamping Voltage (8/20 μs) | | Max. Surge Current (8/20 μs) | Max. Energy (10/1000 μs) |
|-------------|-----------------------------|--------------------------|---------------------|---|-----------|--|--------------------------------------|
| | $V_{1\text{mA}}$ (V) | $V_{\text{AC(rms)}}$ (V) | V_{DC} (V) | V_p (V) | I_p (A) | I (A) | W (J) |
| TVR07471KOY | 470 ± 10 % | 300 | 385 | 775 | 10 | 1200 | 30 |

| Part No. | Rated Power | Impulse Response Time | Max. Leakage Current at 75% $V_{1\text{mA}}$ | Operating Temperature Range | Storage temperature Range |
|-------------|-------------|-----------------------|--|-----------------------------|---------------------------|
| | P (W) | nSec | $I_L(\mu\text{A})$ | ($^\circ\text{C}$) | ($^\circ\text{C}$) |
| TVR07471KOY | 0.25 | <25 | 20 | -40 ~ +85 | -40 ~ +125 |

Reliability

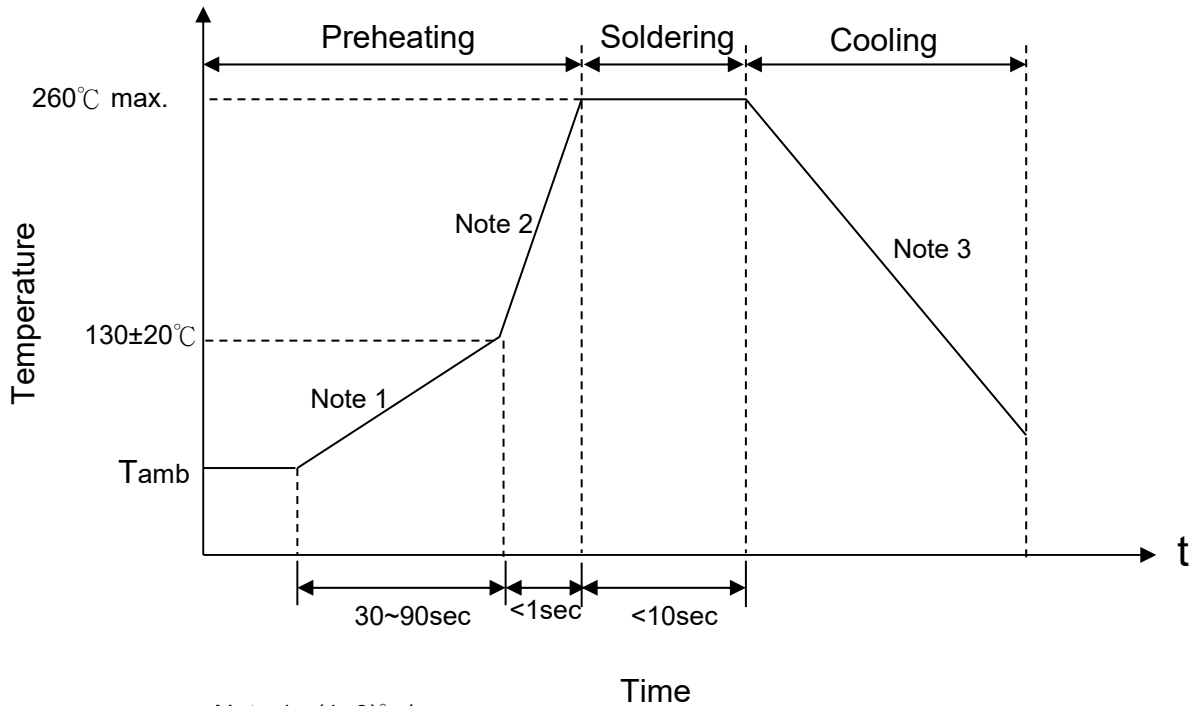
| Item | Standard | Test conditions / Methods | Specifications | | | | | | | | | | | | | | | |
|-------------------------------|------------------------|---|---|------------------|------------------|-----|------------|--------|--------|------------------|---|---|--------|--------|---|------------------|-------|---|
| 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 | 8/20us waveform, 10 surge currents, unipolar, interval 30secs, amplitude corresponding 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 : (1~3)°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 2015/863/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 :TVR07471)

* UL 1449 4th / cUL recognized (File # E314979)



* TÜV recognized (File J50411784)



* CSA 22.2 recognized (File # 97495)



* VDE IEC 61051-1:2007/IEC 61051-2:1991/ IEC 61051-2-2:1991
DIN EN 61051-1:2009/IEC 61051-2 AMD1:2009(File # 5944)



* CQC GB/T10193-1997 ` GB/T10194-1997 recognized
(File # CQC18001199806/ CQC18001199789)

Certificates

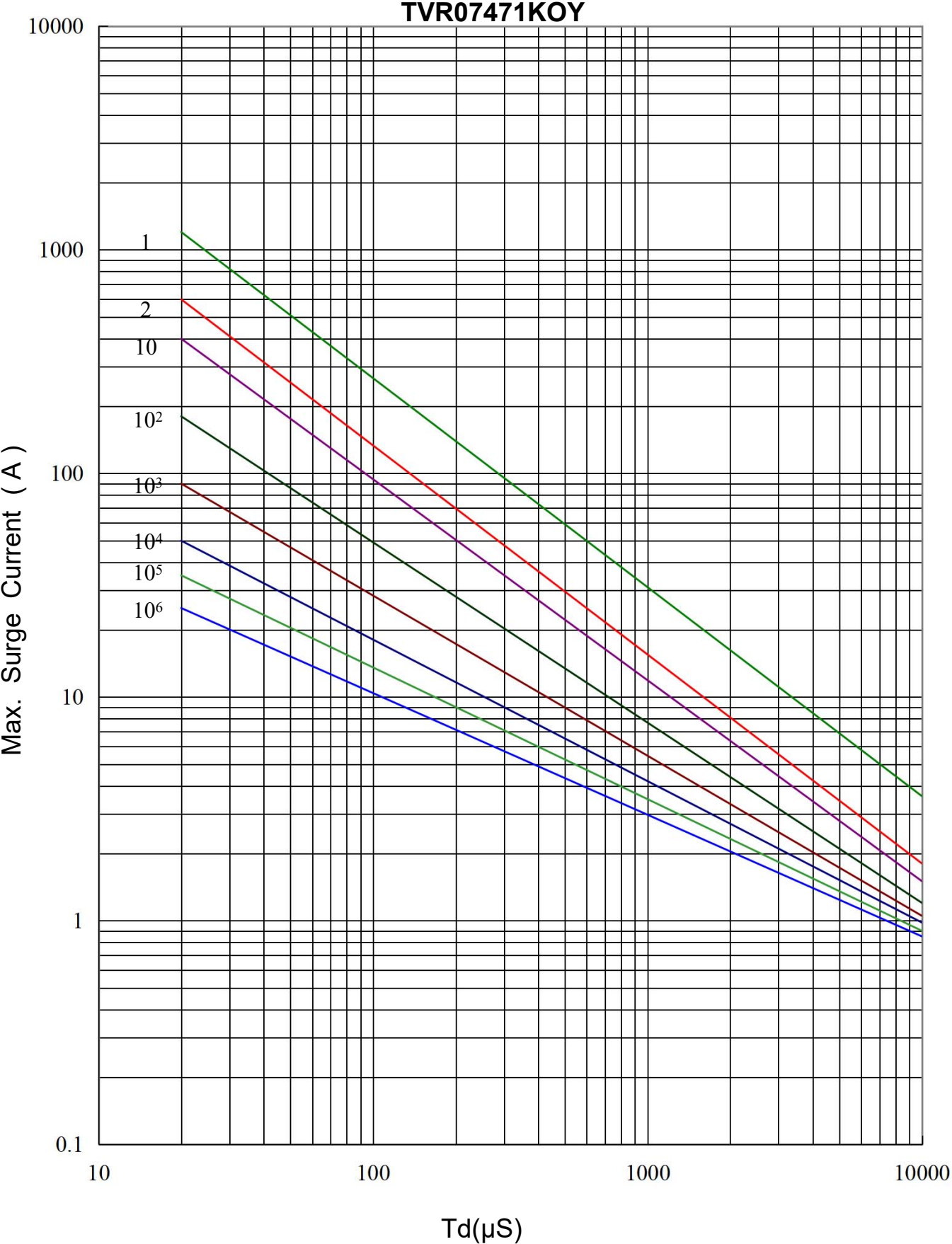
- (1) IATF 16949 certificate
- (2) ISO 9001 certificate

Test Report

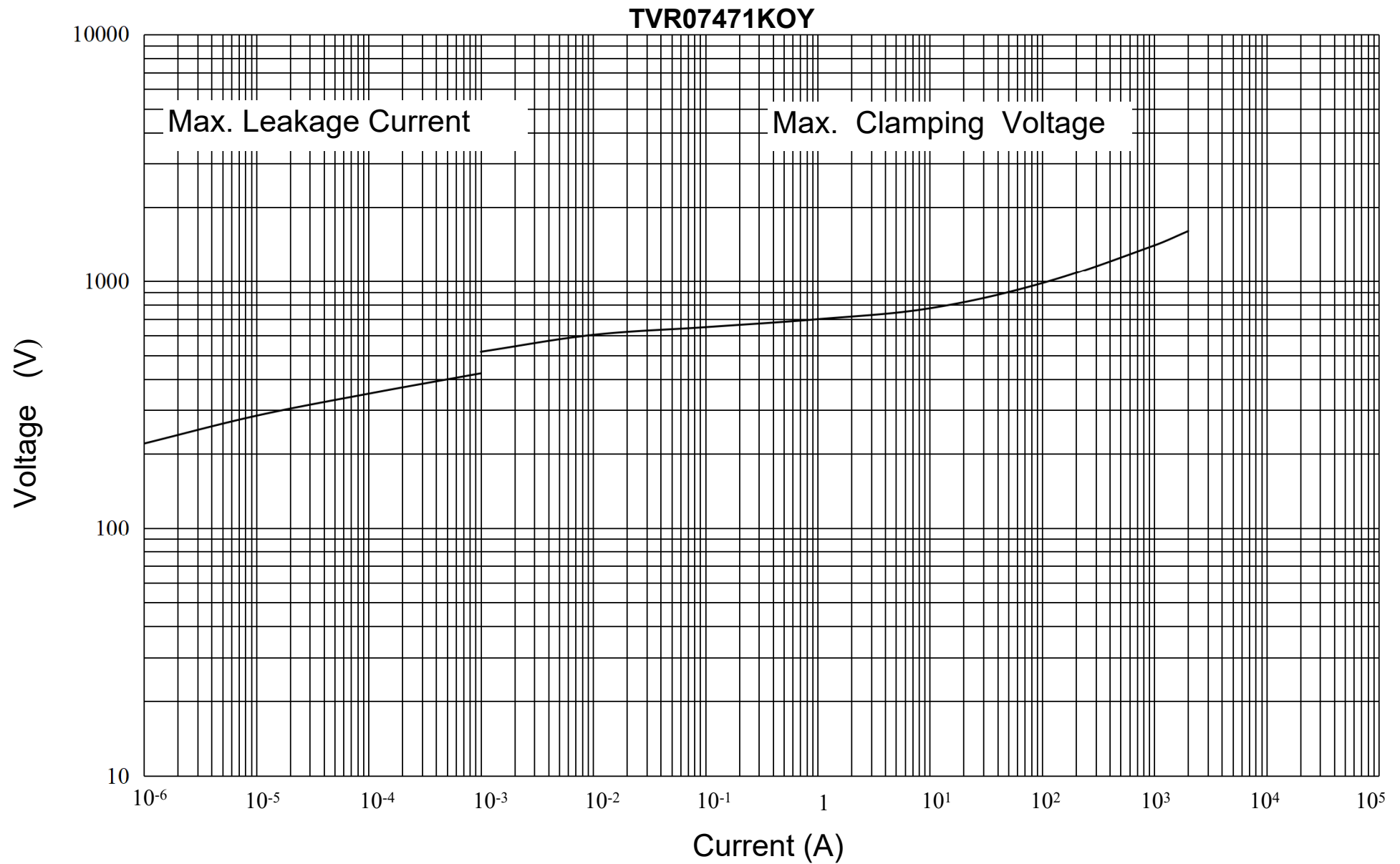
- (1) RoHS test report



Max. Surge Current Derating Curves



Max. Leakage Current and Max. Clamping Voltage Curve



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