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## SPECIFICATION FOR APPROVAL

CUSTOMER \_\_\_\_\_

CERTIFIED MODEL/TYPE TVR07471

PART NO. TVR07471KFARXAF(RoHS+HF)

APPLICATION \_\_\_\_\_

CUSTOMER P/N \_\_\_\_\_

ISSUE DATE Jun.06.2019

REV. NO. \_\_\_\_\_

REV. DATE \_\_\_\_\_

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





**REVISED RECORD SHEET**

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



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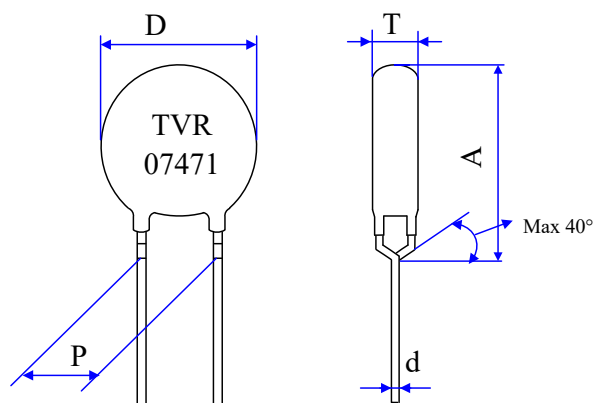
Part Number Code

Example :

**TVR**   **07**   **471**   **K**   **F**   **AR**   **XAF**  
 (1)   (2)   (3)   (4)   (5)   (6)   (7)

| 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                    | F     | Y Kink Lead, Epoxy Coating                                |
| (6) | Packaging                     | A     | Repositioning tapping ( hole pitch: 12.7mm)               |
|     |                               | R     | reel  |
| (7) | Optional Suffix               | XAF   | 1.RoHS+HF compliance<br>2.Tmax:4.5mm                      |

Structure and Dimensions



( unit : mm )

| Body Size | D       | P       | d        | A max. | Tmax |
|-----------|---------|---------|----------|--------|------|
| φ 07      | 6.5~9.0 | 5.0±0.5 | 0.6±0.02 | 11.5   | 4.5  |

\*Coating material rating:UL 94 V-0

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

| Part No.        | Varistor Voltage<br>(@ 1mA DC) | Max. Operating Voltage |                 | Max. Clamping Voltage<br>(8/20μS) |              | Max. Surge Current<br>(8/20μS) | Max. Energy<br>(10/1000μS) |
|-----------------|--------------------------------|------------------------|-----------------|-----------------------------------|--------------|--------------------------------|----------------------------|
|                 | $V_{1mA}$<br>(V)               | $V_{AC}(rms)$<br>(V)   | $V_{DC}$<br>(V) | $V_p$<br>(V)                      | $I_p$<br>(A) | I<br>(A)                       | W<br>(J)                   |
| TVR07471KFARXAF | 470 ± 10 %                     | 300                    | 385             | 775                               | 10           | 1200                           | 30                         |

| Part No.        | Rated Power | Impulse Response Time | Max. Leakage Current at<br>75% $V_{1mA}$ | Operating Temperature Range | Storage temperature Range |
|-----------------|-------------|-----------------------|--|-----------------------------|---------------------------|
|                 | P<br>(W)    | nSec                  | $I_L(\mu A)$                             | ( $^\circ\text{C}$ )        | ( $^\circ\text{C}$ )      |
| TVR07471KFARXAF | 0.25        | <25                   | 20                                       | -40 ~ +85                   | -40 ~ +125                |

Reliability

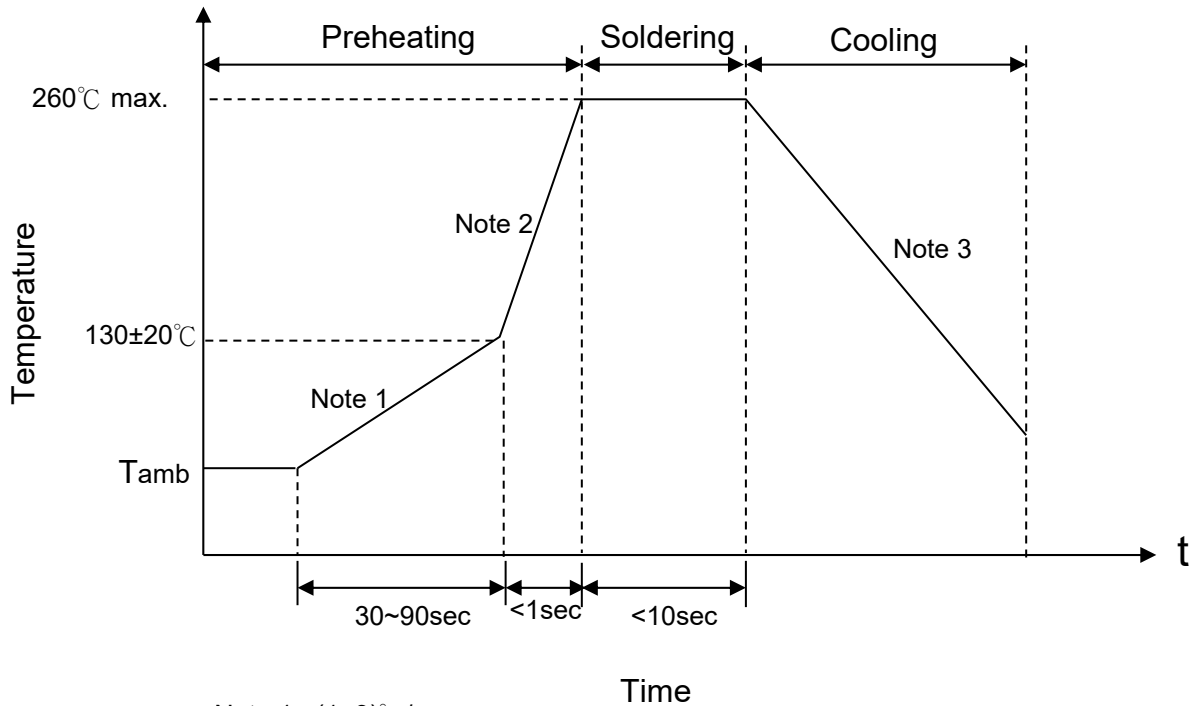
| Item                          | Standard               | Test conditions / Methods   | Specifications   |                  |                  |     |            |        |        |                  |  |   |        |        |   |                  |       |  |
|-------------------------------|------------------------|---|--|------------------|------------------|-----|------------|--------|--------|------------------|--|---|--------|--------|---|------------------|-------|--|
| Tensile Strength of Terminals | IEC60068-2-21          | Gradually applying the force specified and keeping the unit fixed for 10±1 sec.<br><br><table style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;">Terminal diameter<br/>(mm)</td> <td style="text-align: center;">Force<br/>(Kg)</td> </tr> <tr> <td style="text-align: center;">0.5&lt;d≤0.8</td> <td style="text-align: center;">1.0</td> </tr> <tr> <td style="text-align: center;">0.8&lt;d≤1.25</td> <td style="text-align: center;">2.0</td> </tr> <tr> <td style="text-align: center;">1.25&lt;d</td> <td style="text-align: center;">4.0</td> </tr> </table>   | Terminal diameter<br>(mm)  | Force<br>(Kg)    | 0.5<d≤0.8        | 1.0 | 0.8<d≤1.25 | 2.0    | 1.25<d | 4.0              | No visible damage<br>  ΔV/V <sub>1mA</sub>   ≤5% |   |        |        |   |                  |       |  |
| Terminal diameter<br>(mm)     | Force<br>(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.<br><br><table style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;">Terminal diameter<br/>(mm)</td> <td style="text-align: center;">Force<br/>(Kg)</td> </tr> <tr> <td style="text-align: center;">0.5&lt;d≤0.8</td> <td style="text-align: center;">0.5</td> </tr> <tr> <td style="text-align: center;">0.8&lt;d≤1.25</td> <td style="text-align: center;">1.0</td> </tr> <tr> <td style="text-align: center;">1.25&lt;d</td> <td style="text-align: center;">2.0</td> </tr> </table>   | Terminal diameter<br>(mm)  | Force<br>(Kg)    | 0.5<d≤0.8        | 0.5 | 0.8<d≤1.25 | 1.0    | 1.25<d | 2.0              | No visible damage<br>  ΔV/V <sub>1mA</sub>   ≤5% |   |        |        |   |                  |       |  |
| Terminal diameter<br>(mm)     | Force<br>(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<br>Amplitude:0.75mm or 98m/S <sup>2</sup><br>Direction:3 mutually perpendicular directions,2hrs each.   | ΔV/V <sub>1mA</sub>   ≤5%<br>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<br>  ΔV/V <sub>1mA</sub>   ≤5%                                   |                  |                  |     |            |        |        |                  |  |   |        |        |   |                  |       |  |
| High Temperature Storage      | IEC60068-2-2           | 125 ± 5 °C , 1000 ± 24 hrs  | No visible damage<br>  ΔV/V <sub>1mA</sub>   ≤5%                                   |                  |                  |     |            |        |        |                  |  |   |        |        |   |                  |       |  |
| Damp Heat, Steady State       | IEC 60068-2-78         | The test is divided into two groups .<br>a.40 ± 2°C , 90 ~ 95 % RH , 1344 hrs<br>b.40 ± 2°C , 90 ~ 95 % RH , at 10%V <sub>DC</sub> , 1344 hrs   | No visible damage<br>  ΔV/V <sub>1mA</sub>   ≤10%<br>Insulation Resistance ≥ 100MΩ |                  |                  |     |            |        |        |                  |  |   |        |        |   |                  |       |  |
| Rapid Change of Temperature   | IEC60068-2-14          | The conditions shown below shall be repeated 5 cycles<br><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<br>  ΔV/V <sub>1mA</sub>   ≤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 <sub>DC</sub> or V <sub>rms</sub> (Max. Operating Voltage)  | ΔV/V <sub>1mA</sub>   ≤10%<br>No visible damage                                    |                  |                  |     |            |        |        |                  |  |   |        |        |   |                  |       |  |



| Item  | Standard                  | Test conditions / Methods  | Specifications                                      |
|---|---------------------------|--|---|
| 8/20μS<br>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 20μs  | $ \Delta V/V_{1mA}  \leq 10\%$<br>No visible damage |
| 10/1000μS<br>Surge Life                     | IEC 61051-1 4.6           | 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\%$<br>No visible damage |
| Varistor<br>Voltage<br>Temp.<br>Coefficient | Specification<br>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<br>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) $^\circ\text{C}/\text{sec}$   
 Note 2 : Approx. 200 $^\circ\text{C}/\text{sec}$   
 Note 3 : 5 $^\circ\text{C}/\text{sec}$  Max

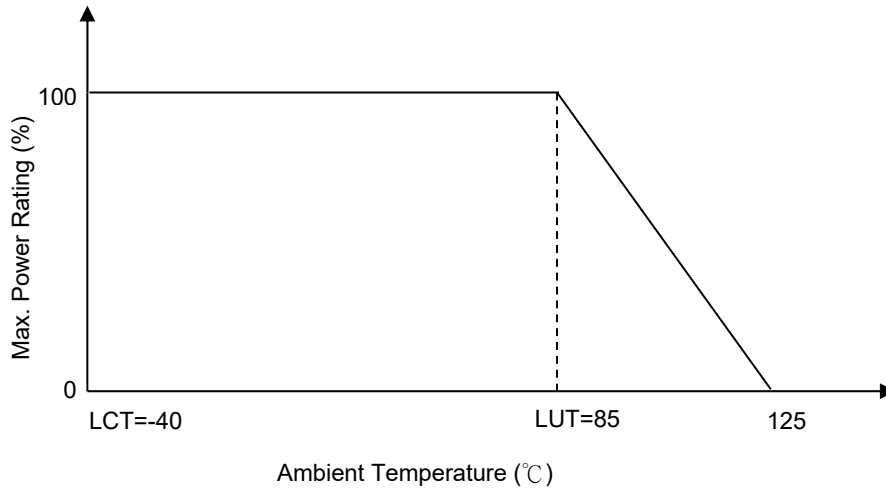
### Recommended Reworking Conditions with Soldering Iron

| Item                              | Conditions                  |
|-----------------------------------|-----------------------------|
| Temperature of Soldering Iron-tip | 360 $^\circ\text{C}$ (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.

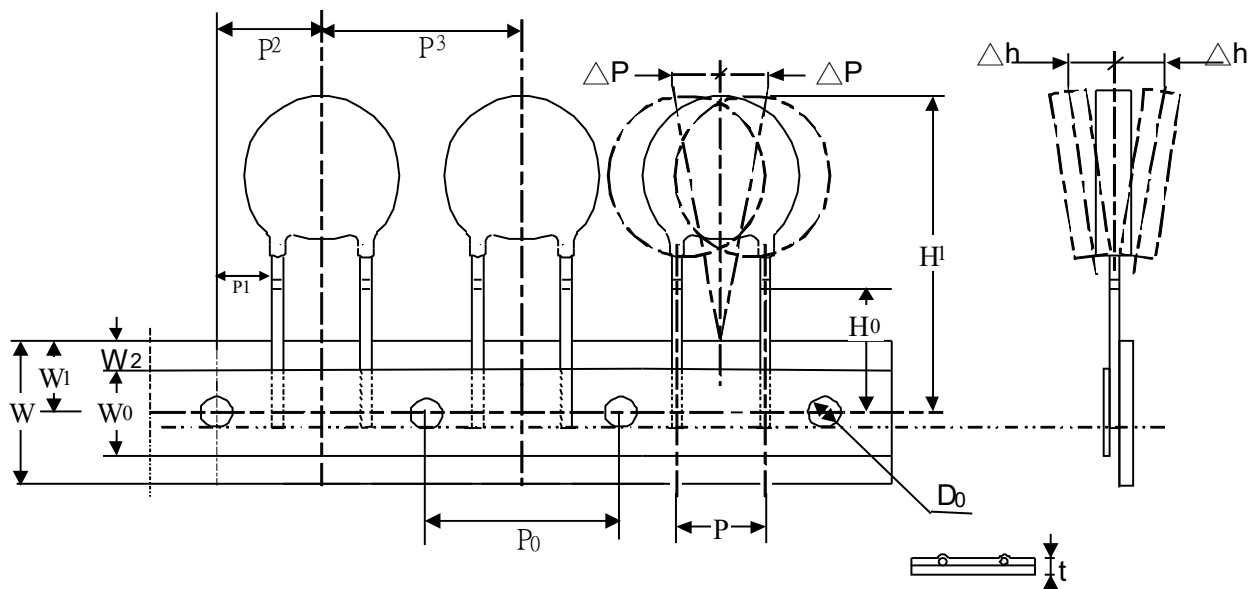
### Warehouse Storage Conditions of Products

(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

Taping and Dimensions

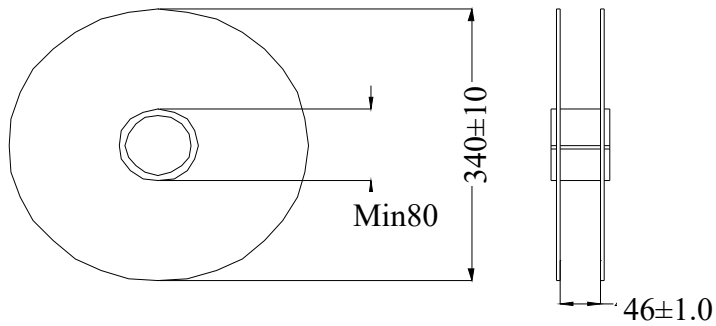


( Unit : mm )

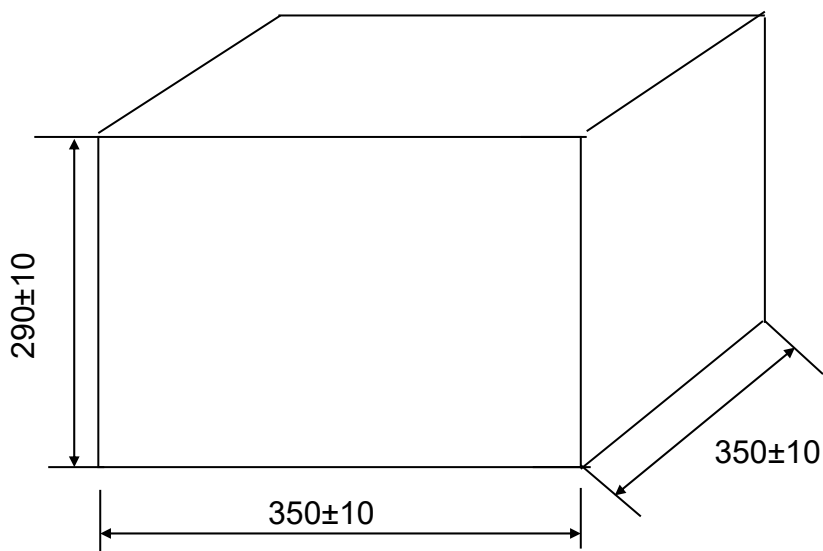
| ITEM. | $P_0$     | $P$       | $P_1$   | $P_2$     | $P_3$   | $H_0$     | $H_1$<br>Max | $W_0$   | $W_1$        | $W_2$<br>Max | $W$     | $\Delta P$<br>Max | $\Delta h$<br>Max | $D_0$     | $t$       |
|-------|-----------|-----------|---------|-----------|---------|-----------|--------------|---------|--------------|--------------|---------|-------------------|-------------------|-----------|-----------|
| Nor.  | 12.7      | 5.0       | 3.55    | 6.35      | 12.7    | 16        | 30           | 12      | 9            | 3            | 18      | 1.0               | 2.0               | 4         | 0.6       |
| ToL.  | $\pm 0.3$ | $\pm 0.5$ | $\pm 1$ | $\pm 1.3$ | $\pm 1$ | $\pm 0.5$ | ---          | $\pm 1$ | $+0.75/-0.5$ | ---          | $\pm 1$ | ---               | ---               | $\pm 0.2$ | $\pm 0.2$ |

## Packaging

(1) SPQ: 1000 Pcs/ Reel



(2) Outer Box (5 Boxes /Carton)



(Unit:mm)

Safety Approvals (Certified Model/Type :TVR07471)

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



\* TUV 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

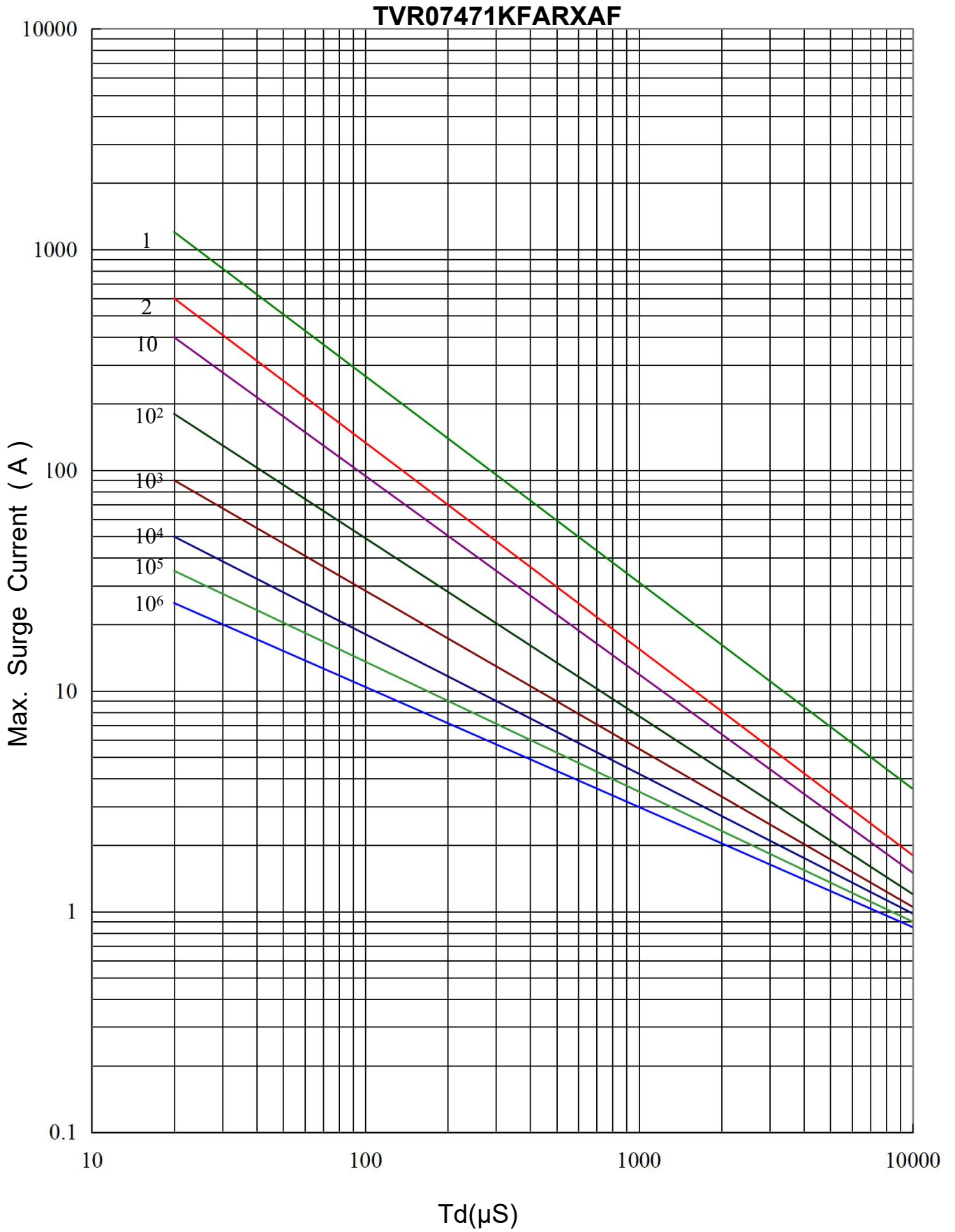
- (1) IATF 16949 certificate
- (2) ISO 9001 certificate

Test Report

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



Max. Surge Current Derating Curves



Max. Leakage Current and Max. Clamping Voltage Curve

