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## SPECIFICATION FOR APPROVAL

|              |                         |
|--------------|-------------------------|
| CUSTOMER     | Codico                  |
| CERTIFIED    |                         |
| MODEL/TYPE   | TVR07431-M              |
| PART NO.     | TVR07431KLABM (RoHS+HF) |
| APPLICATION  |                         |
| CUSTOMER P/N |                         |
| ISSUE DATE   | Mar.12.2016             |
| REV. NO      |                         |
| REV. DATE    |                         |

|                              |                    |
|------------------------------|--------------------|
| <b>FOR CUSTOMER APPROVAL</b> | <b>CHECKED BY</b>  |
|                              | Yuan Yuan          |
|                              | <b>APPROVED BY</b> |
|                              | Huaifang Zhang     |





**REVISED RECORD SHEET**

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



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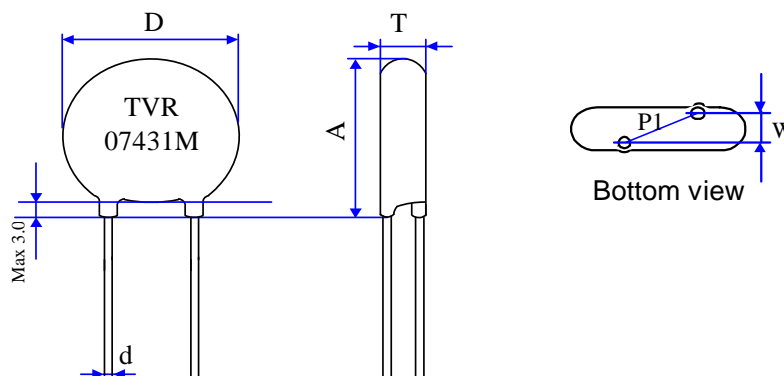
Part Number Code

Example :

**TVR**    **07**    **431**    **K**    **L**    **AB**    **M**  
 (1)    (2)    (3)    (4)    (5)    (6)    (7)

| No. | Item                          | Digit | Specification   |
|-----|-------------------------------|-------|---|
| (1) | Product Type                  | TVR   | Thinking varistor TVR type                                |
| (2) | Body Size                     | 07    | φ07 mm  |
| (3) | Varistor Voltage              | 431   | $43 \times 10^1 \text{ V} = 430\text{V} (V_{1\text{mA}})$ |
| (4) | Tolerance of $V_{1\text{mA}}$ | K     | ±10%  |
| (5) | Appearance                    | L     | Straight lead, Silicon Coating                            |
| (6) | Packaging                     | A     | Repositioning tapping( hole pitch: 12.7mm)                |
|     |                               | B     | box   |
| (7) | Optional Suffix               | M     | RoHS+HF compliance  |

Structure and Dimensions



( unit : mm )

| Body Size | D       | P 1   | d        | A max. | T         | W       |
|-----------|---------|-------|----------|--------|-----------|---------|
| φ 07      | 6.4~9.6 | 5.0±1 | 0.6±0.02 | 11.0   | 4.16~6.24 | 2.3±1.0 |

\*Coating material rating:UL 94 V-0

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

| 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)                   |
| TVR07431KLABM | 430 ± 10%                   | 275                     | 350          | 710                            | 10        | 1750                        | 40                      |

| Part No.      | Rated Power | Impulse Response Time | Max. Leakage Current at 75% $V_{1mA}$ | Operating Temperature Range | Storage temperature Range | Applications |             |           |
|---------------|-------------|-----------------------|---------------------------------------|-----------------------------|---------------------------|--------------|-------------|-----------|
|               | P (W)       | nSec                  | $I_L(\mu A)$                          | ( $^\circ\text{C}$ )        | ( $^\circ\text{C}$ )      | UL 1449      | IEC 60950-1 | IEC 60065 |
| TVR07431KLABM | 0.25        | <25                   | 20                                    | -40 ~ +125                  | -40 ~ +150                | SPD Type 5   | —           | —         |

The mechanical force acted on the wire lead may cause cracks and chips of coating ,but which does not affect the performance of the component

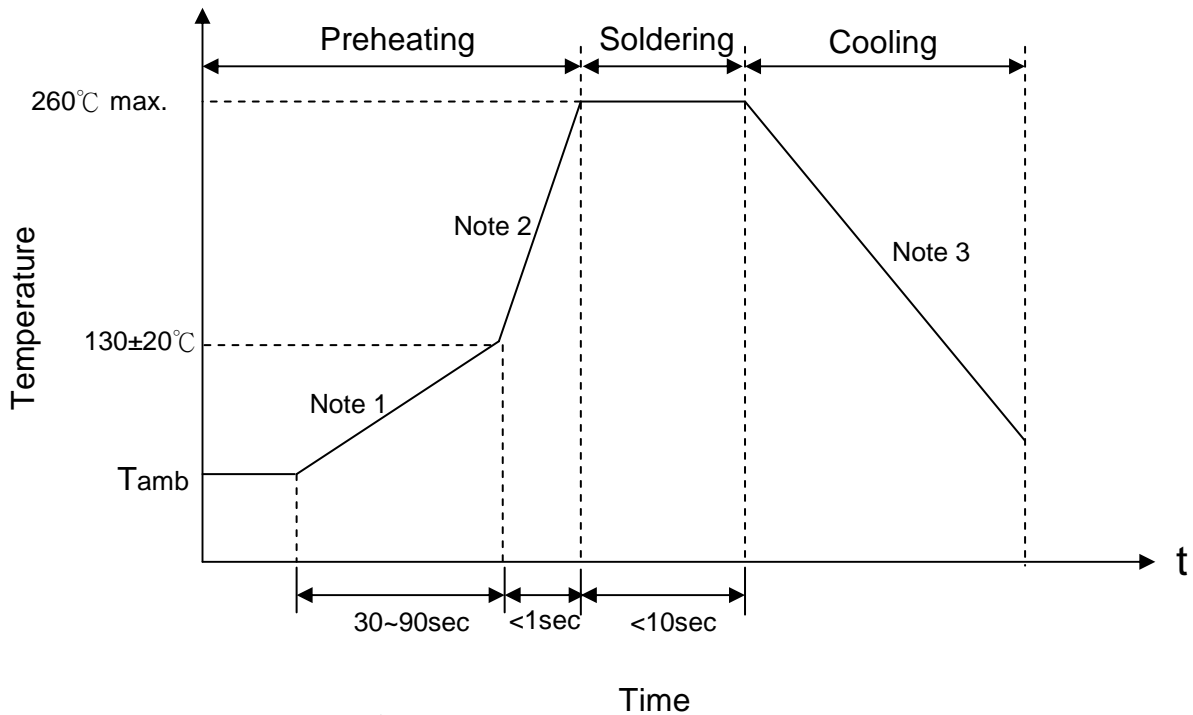
Reliability

| 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 border="0" 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 border="0" 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              | 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           | 150 ± 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 1000cycles<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;">125 ± 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 | 125 ± 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                             | 125 ± 2                | 30 ± 3   |  |                  |                  |     |            |        |        |                  |  |   |         |        |   |                  |       |  |
| 4                             | Room temperature       | 5 ± 3  |  |                  |                  |     |            |        |        |                  |  |   |         |        |   |                  |       |  |
| High Temp. Load               | MIL-STD-202 Method 108 | 125 ± 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                                    |                  |                  |     |            |        |        |                  |  |   |         |        |   |                  |       |  |
| Flammability test             | Specification Standard | The varistor shall be subjected to 60sec.applications of test flame.<br>Burner:Bunsen gas burner 9000kcal/m <sup>3</sup><br>Diameter of flame nozzle: Φ9.5mm<br>Position : the specimen shall be fixed horizontal<br>Point of application shall be approximately center of the specimen  | No catching fire,and no flaming drops  |                  |                  |     |            |        |        |                  |  |   |         |        |   |                  |       |  |

| Item  | Standard                  | Test conditions / Methods  | Specifications                                      |
|---|---------------------------|--|---|
| 8/20 $\mu$ S<br>Surge Life                  | IEC 61051-1 4.6           | 10,000 pulses( 8/20 $\mu$ S) , unipolar, interval 10 secs, amplitude corr. to max. Surge current derating curves for 20 $\mu$ S  | $ \Delta V/V_{1mA}  \leq 10\%$<br>No visible damage |
| 10/1000 $\mu$ S<br>Surge Life               | IEC 61051-1 4.6           | 10/1000 $\mu$ S waveform, 10 surge currents,unipolar,interval 2mins, amplitude corr. to max. surge current derating curves for 1000 $\mu$ S  | $ \Delta V/V_{1mA}  \leq 10\%$<br>No visible damage |
| Varistor<br>Voltage<br>Temp.<br>Coefficient | Specification<br>Standard | $\frac{V_{1mA} \text{ at } 125^{\circ}\text{C} - V_{1mA} \text{ at } 25^{\circ}\text{C}}{V_{1mA} \text{ at } 25^{\circ}\text{C}} \times \frac{1}{100} \times 100 (\% / ^{\circ}\text{C})$ $\frac{V_{1mA} \text{ at } -40^{\circ}\text{C} - V_{1mA} \text{ at } 25^{\circ}\text{C}}{V_{1mA} \text{ at } 25^{\circ}\text{C}} \times \frac{1}{65} \times 100 (\% / ^{\circ}\text{C})$ | $-0.05 \leq TC \leq 0.05 (\% / ^{\circ}\text{C})$   |
| Voltage<br>Proof                            | IEC 61051-1 4.9           | Metal balls method, 1000 Vac 1 min   | No visible damage                                   |

## Soldering Recommendation

### ■ Wave Soldering Profile



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

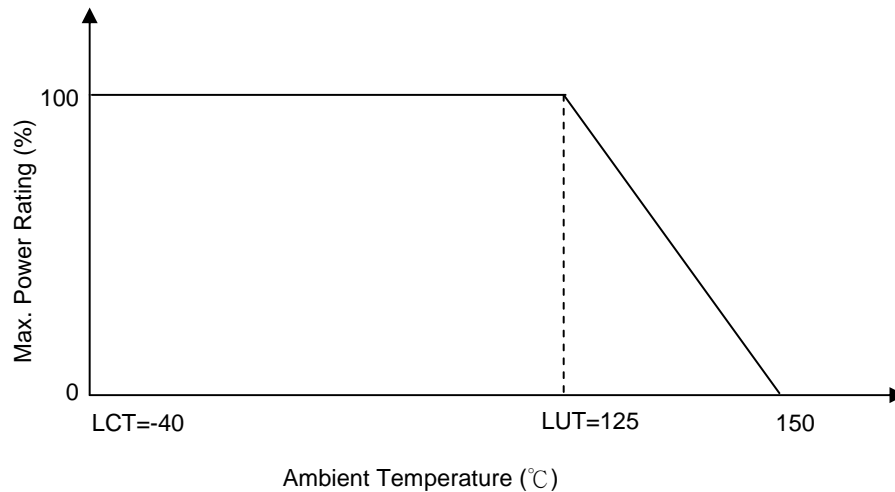
### ■ Recommended Reworking Conditions with Soldering Iron

| 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 125°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 -4%.



### RoHS Compliant Declaration

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

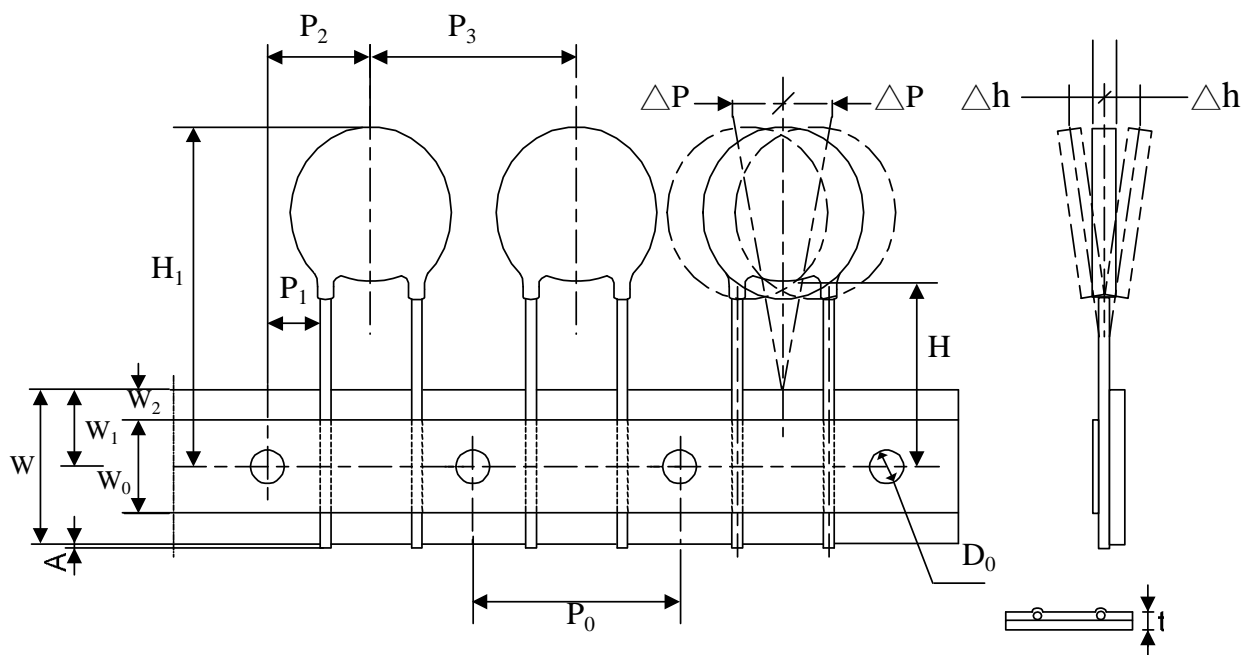
### Warehouse Storage Conditions of Products

(I) Storage Conditions :

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

(II) Period of Storage : 1 year

Taping and Dimensions

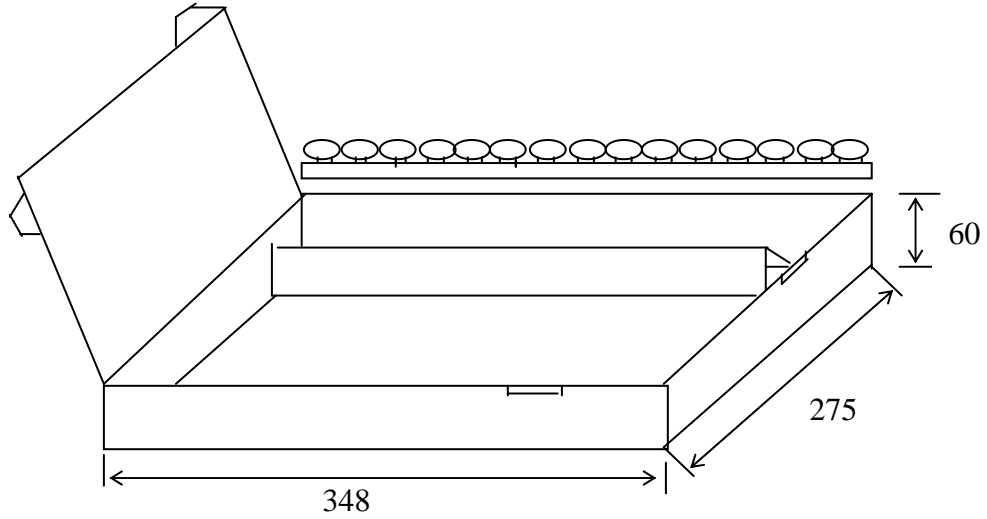


| ITEM. | P <sub>0</sub> | P <sub>1</sub> | P <sub>2</sub> | P <sub>3</sub> | H     | H <sub>1</sub><br>Max | W <sub>0</sub> | W <sub>1</sub> | W <sub>2</sub><br>Max | W  | Δp<br>Max | Δh<br>Max | A<br>Max | D <sub>0</sub> | t    |
|-------|----------------|----------------|----------------|----------------|-------|-----------------------|----------------|----------------|-----------------------|----|-----------|-----------|----------|----------------|------|
| Nor.  | 12.7           | 3.55           | 6.35           | 12.7           | 18    | 31                    | 12             | 9              | 3                     | 18 | 1.0       | 2.0       | 0.5      | 4              | 0.6  |
| ToL.  | ±0.3           | ±1             | ±1.3           | ±1             | +2/-0 | ---                   | ±1             | +0.75/<br>-0.5 | ---                   | ±1 | ---       | ---       | ---      | ±0.2           | ±0.2 |

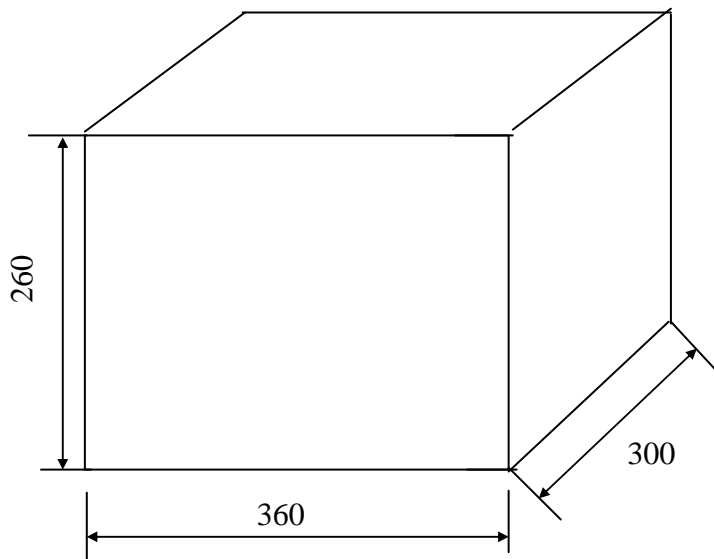
(Unit:mm)

Packaging

(1) Inner Box (1000pcs /Box)



(2) Outer Box (4 Boxes /Carton)



(Unit:mm)

Safety Approvals (Certified Model/Type:TVR07431-M)

- \* UL 1449 4th / cUL recognized (File # E314979)
- UL1449 (file number E314979) for use in SPD Type 5



- \* VDE IEC 61051-1:2007-04 / IEC 61051-2:1991
- IEC 61051-2-2:1991 recognized (File # 40036061)



- \* CQC GB/T10193-1997 \ GB/T10194-1997 recognized
- (File # CQC13001090357/CQC13001090356)

Certificates

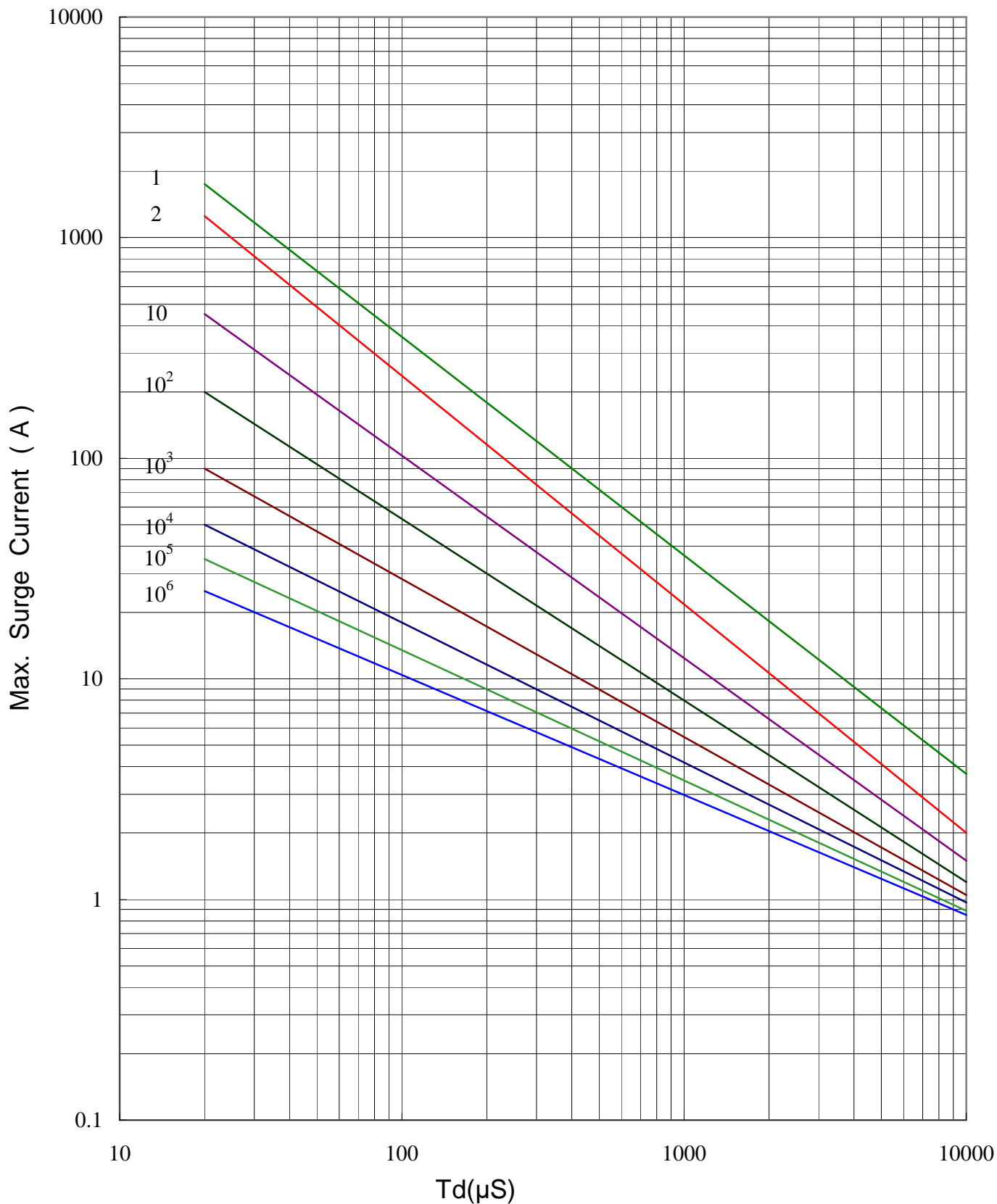
- (1) TS 16949 certificate
- (2) ISO 9001 certificate

Test Report

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

Max. Surge Current Derating Curves

TVR07431KLABM





Max. Leakage Current and Max. Clamping Voltage Curve

**TVR07431KLABM**

