



# THINKING ELECTRONIC INDUSTRIAL CO., LTD.

HEAD OFFICE: 12F, No.93, Dashun 1st Rd., Zuoying Dist., Kaohsiung, Taiwan  
TEL: 886-7-5577660 FAX: 886-7-5570560

## MANUFACTURING SITE

- KAOHSIUNG FACTORY 1: No. 51, Kaifa Rd., N.E.P.Z, Kaohsiung City 81170, Taiwan  
TEL: 886-7-9616668 FAX: 886-7-9616698
- KAOHSIUNG FACTORY 2: No. 2-2, Xinjian S. Rd., N.E.P.Z., Kaohsiung City 81170, Taiwan  
TEL: 886-7-9630001 FAX: 886-7-3635113
- CHANGZHOU FACTORY: No.6 Longmen Rd., Wujin High & New-Tech Industrial  
Development Zone, Changzhou, Jiangsu, China 213161  
TEL: 86-519-86578999 FAX: 86-519-86558643
- DONG GUAN FACTORY: No.45, East Rd., Sha-Tao Dist., Chang-An Town,  
Dongguan City, Guangdong, China 523863  
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

TVR20821

PART NO.

TVR20821KOUD4Y(RoHS)

APPLICATION \_\_\_\_\_

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

ISSUE DATE

Sep.25.2021

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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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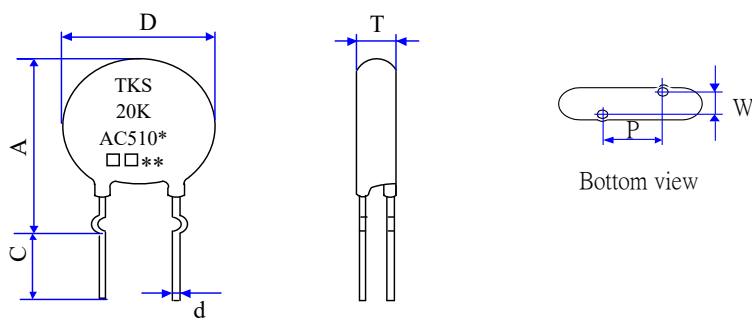
Part Number Code

Example :

**TVR**    **20**    **821**    **K**    **O**    **UD4Y**  
 (1)        (2)        (3)        (4)        (5)        (6)

| No. | Item                          | Digit | Specification  |
|-----|-------------------------------|-------|--|
| (1) | Product Type                  | TVR   | Thinking varistor TVR type                                       |
| (2) | Body Size                     | 20    | φ 20 mm  |
| (3) | Varistor Voltage              | 821   | $82 \times 10^1 \text{ V} = 820\text{V} (V_{1\text{mA}})$        |
| (4) | Tolerance of $V_{1\text{mA}}$ | K     | ±10%   |
| (5) | Appearance                    | O     | Kink -out Lead ; Epoxy Coating                                   |
| (6) | Optional Suffix               | UD4Y  | 1.Max.Surge Current (8/20uS)(1 time):10000A<br>2.RoHS compliance |

Structure and Dimensions



( unit : mm )

| Body Size | Dmax | P        | d         | A max. | C       | Tmax | W       |
|-----------|------|----------|-----------|--------|---------|------|---------|
| φ 20      | 20   | 10.0±0.5 | 1.00±0.02 | 22.0   | 3.5±0.5 | 9    | 3.6±1.0 |

\*Coating material rating:UL 94 V-0

Electrical Characteristics ( Ambient Ta=25 °C )

| Part No.       | Varistor Voltage<br>(@ 1mA DC) | Max. Continuous Voltage     |                        | Max. Clamping Voltage<br>(8/20μS) |                       | Max. Surge Current<br>(8/20μS) | Max. Surge Current<br>(8/20μS)<br>(10 <sup>4</sup> times) |
|----------------|--------------------------------|-----------------------------|------------------------|-----------------------------------|-----------------------|--------------------------------|---|
|                | V <sub>1mA</sub><br>(V)        | V <sub>AC(rms)</sub><br>(V) | V <sub>DC</sub><br>(V) | V <sub>p</sub><br>(V)             | I <sub>p</sub><br>(A) | I<br>(A)                       | I<br>(A)  |
| TVR20821KOUD4Y | 820 ± 10 %                     | 510                         | 670                    | 1355                              | 100                   | 10000                          | 250   |

| Part No.       | Max. Surge Current<br>(8/20μS)<br>(40times) | Max. Energy<br>(10/1000μS) | Rated Power | Impulse Response Time | Max Capacitance<br>@1KHZ | Max. Leakage Current at<br>75%V <sub>1mA</sub> | Operating Temperature Range | Storage temperature Range |
|----------------|---|----------------------------|-------------|-----------------------|--------------------------|--|-----------------------------|---------------------------|
|                | I<br>(A)                                    | W<br>(J)                   | P<br>(W)    | nSec                  | C<br>(pF)                | I <sub>L</sub> (μA)                            | ( °C )                      | ( °C )                    |
| TVR20821KOUD4Y | 3000  | 290                        | 1           | <25                   | 1400                     | 20   | -40 ~ +105                  | -40 ~ +125                |



Reliability

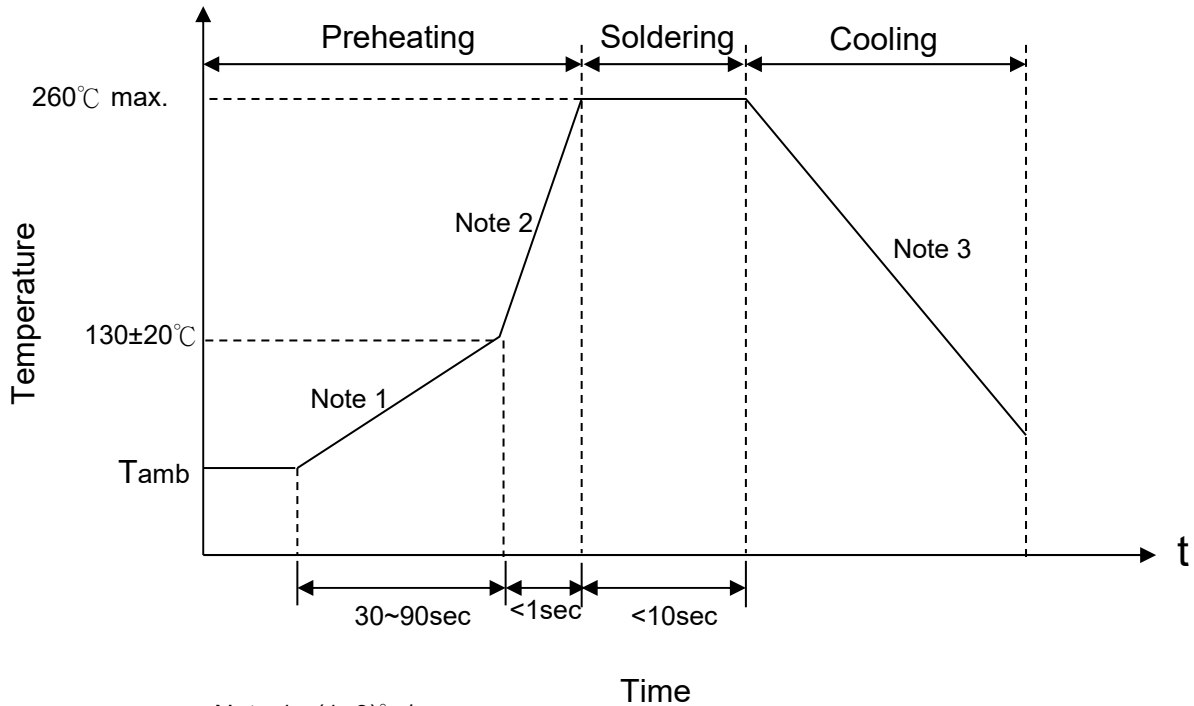
| Item                          | Standard               | Test conditions / Methods   | Specifications   |                  |                  |     |            |        |        |                  |  |   |         |        |   |                  |       |  |
|-------------------------------|------------------------|---|--|------------------|------------------|-----|------------|--------|--------|------------------|--|---|---------|--------|---|------------------|-------|--|
| Tensile Strength of Terminals | IEC60068-2-21          | Gradually applying the force specified and keeping the unit fixed for 10±1 sec.<br><br><table border="1"> <thead> <tr> <th>Terminal diameter (mm)</th> <th>Force (Kg)</th> </tr> </thead> <tbody> <tr> <td>0.5&lt;d≤0.8</td> <td>1.0</td> </tr> <tr> <td>0.8&lt;d≤1.25</td> <td>2.0</td> </tr> <tr> <td>1.25&lt;d</td> <td>4.0</td> </tr> </tbody> </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<br>  ΔV/V <sub>1mA</sub>   ≤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.<br><br><table border="1"> <thead> <tr> <th>Terminal diameter (mm)</th> <th>Force (Kg)</th> </tr> </thead> <tbody> <tr> <td>0.5&lt;d≤0.8</td> <td>0.5</td> </tr> <tr> <td>0.8&lt;d≤1.25</td> <td>1.0</td> </tr> <tr> <td>1.25&lt;d</td> <td>2.0</td> </tr> </tbody> </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<br>  ΔV/V <sub>1mA</sub>   ≤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<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><br><table border="1"> <thead> <tr> <th>Step</th> <th>Temperature (°C)</th> <th>Period (minutes)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>-40 ± 3</td> <td>30 ± 3</td> </tr> <tr> <td>2</td> <td>Room temperature</td> <td>5 ± 3</td> </tr> <tr> <td>3</td> <td>105 ± 2</td> <td>30 ± 3</td> </tr> <tr> <td>4</td> <td>Room temperature</td> <td>5 ± 3</td> </tr> </tbody> </table>         | Step   | Temperature (°C) | Period (minutes) | 1   | -40 ± 3    | 30 ± 3 | 2      | Room temperature | 5 ± 3  | 3 | 105 ± 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                             | 105 ± 2                | 30 ± 3  |  |                  |                  |     |            |        |        |                  |  |   |         |        |   |                  |       |  |
| 4                             | Room temperature       | 5 ± 3   |  |                  |                  |     |            |        |        |                  |  |   |         |        |   |                  |       |  |
| High Temp. Load               | MIL-STD-202 Method 108 | 105 ± 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                                      |
|---|---------------------------|---|---|
| 8/20 $\mu$ S<br>Surge Life                  | IEC 61051-1 4.6           | 10 pulses( 8/20 $\mu$ S) , unipolar, interval 30 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 | $\frac{V_{1mA} \text{ at } 105^{\circ}\text{C} - V_{1mA} \text{ at } 25^{\circ}\text{C}}{V_{1mA} \text{ at } 25^{\circ}\text{C}} \times \frac{1}{80} \times 100 (\% / ^{\circ}\text{C})$ $\frac{V_{1mA} \text{ at } -40^{\circ}\text{C} - V_{1mA} \text{ at } 25^{\circ}\text{C}}{V_{1mA} \text{ at } 25^{\circ}\text{C}} \times \frac{1}{65} \times 100 (\% / ^{\circ}\text{C})$ | $-0.05 \leq TC \leq 0.05 (\% / ^{\circ}\text{C})$   |
| Voltage<br>Proof                            | IEC 61051-1 4.9           | Metal balls method, 2500 Vac 1 min  | No visible damage                                   |
| Humidity<br>Aging                           | Specification<br>Standard | 85 $^{\circ}$ C , 85%RH,at Vac(Max. Operating Voltage) 96hrs  | $ \Delta V/V_{1mA}  \leq 10\%$<br>No visible damage |
| High Temp.<br>Load                          | Specification<br>Standard | 125 $^{\circ}$ C , 96hrs, at V <sub>ac</sub> (Max. Operating Voltage)   | $ \Delta V/V_{1mA}  \leq 10\%$<br>No visible damage |
| Surge life<br>test                          | Specification<br>Standard | a.3KA,Interval 90S, +20times,-20times ;<br>b.10000 times charge 250A,The max charge no. n=0.9*p0*50000/(Vc*la),50 $\pm$ 5 time, then change polarity  | 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

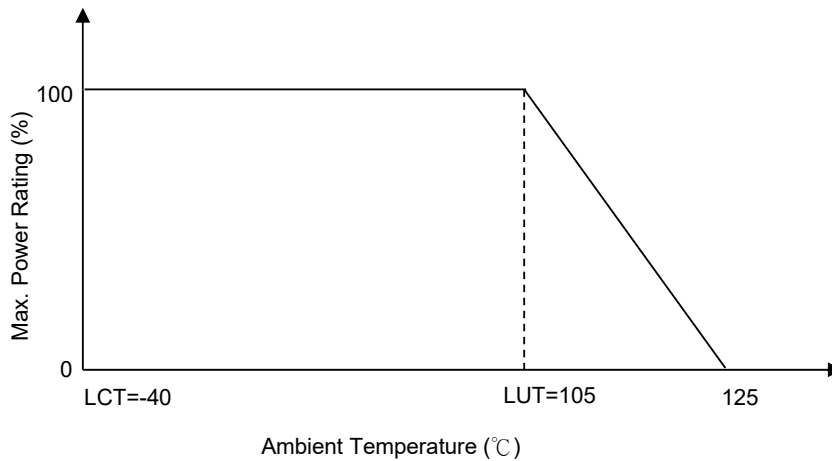
### Recommended Reworking Conditions with Soldering Iron

| 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 105°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 -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:TVR20821)

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



- \* TUV recognized (File J50411784)



- \*VDE IEC 61051-1:2007/IEC 61051-2:1991/ IEC 61051-2-2:1991  
DIN EN 61051-1:2009/IEC 61051-2 AMD1:2009  
IEC 62368-1:2018 G.8.1 recognized(File # 40031391)  
(VDE approval to IEC 61051 with upper category temperature = 85°C)



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

Certificates

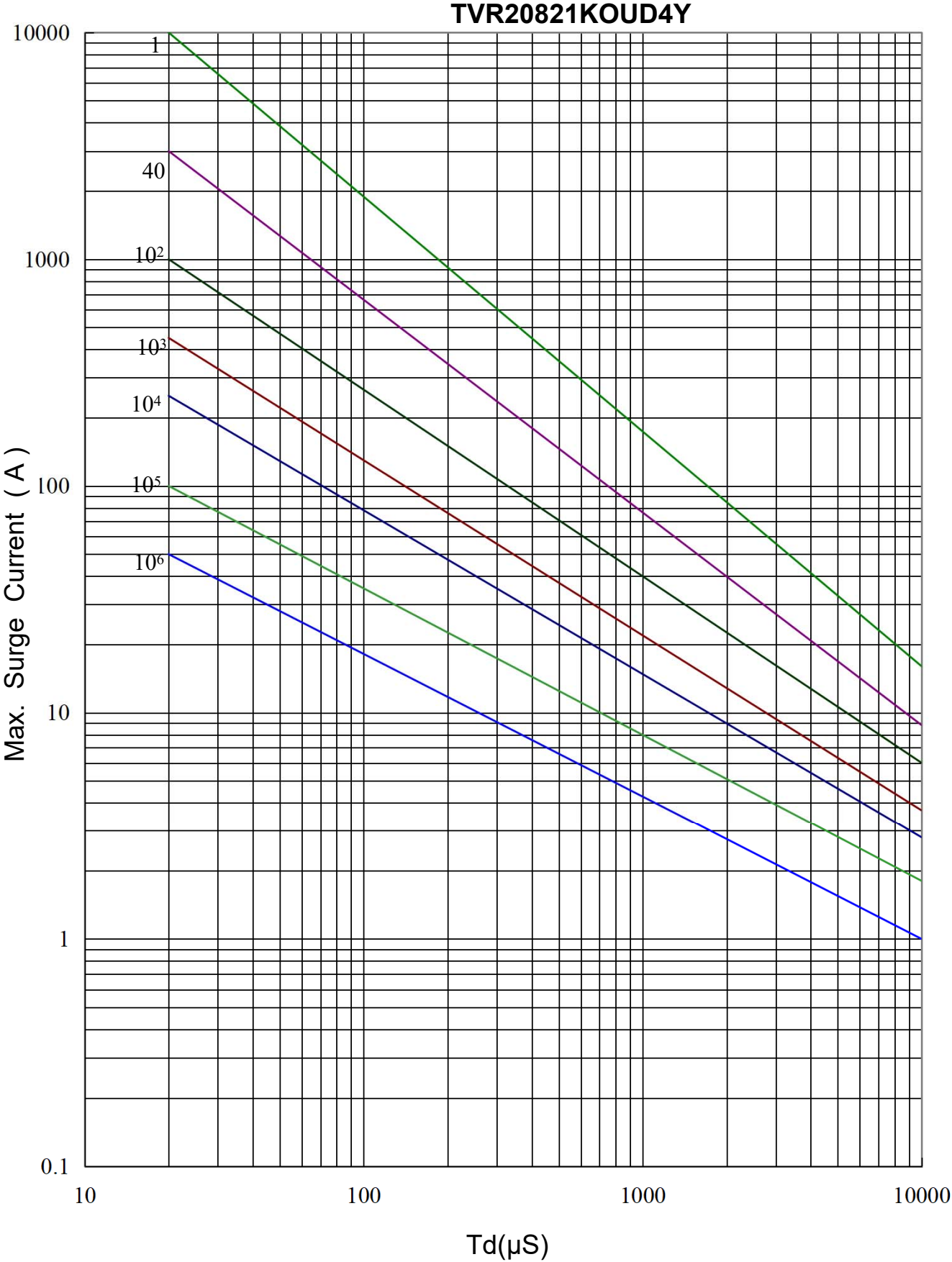
- (1) IATF 16949 certificate
- (2) ISO 9001 certificate

Test Report

- (1) RoHS test report



Max. Surge Current Derating Curves





Max. Leakage Current and Max. Clamping Voltage Curve

