

Kunde / customer :

Artikelnummer / part number : 82537259

Datum / Date : 31.07.06

Bezeichnung :

description : 0402 SMD VARISTOR

Lead Free

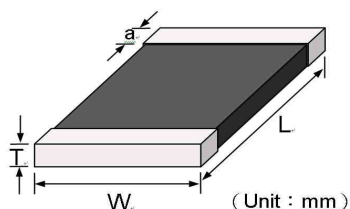
SMD size: 0402 ROHS Compliant

**A Mechanische Abmessungen / dimensions :**

SIZE

(Unit : mm)

| SIZE | W    | L   | T   | a    |
|------|------|-----|-----|------|
| 402  | 0.5  | 1.0 | 0.6 | 0.25 |
| 603  | 0.8  | 1.6 | 0.9 | 0.3  |
| 805  | 1.25 | 2.0 | 1.2 | 0.3  |
| 1206 | 1.6  | 3.2 | 1.5 | 0.5  |
| 1210 | 2.5  | 3.2 | 1.5 | 0.5  |
| 1812 | 3.2  | 4.5 | 2.0 | 0.5  |
| 2220 | 5.0  | 5.7 | 2.5 | 0.5  |

**B Elektrische Eigenschaften / electrical properties :**

## TECHNICAL DATA

| Part Number | Working Voltage |     | Clamping Voltage | Peak Current | Energy | Breakdown Voltage | Capacitance |
|-------------|-----------------|-----|------------------|--------------|--------|-------------------|-------------|
|             | AC              | DC  | V (*2)           | A (*3)       | J (*4) | V (*1)            | pF (*4)     |
| 82537259    | 2.5             | 3.3 | 13               | 20           | 0.04   | 5.5               | 180         |

\* 1 The varistor voltage was measured at 1 mA current , tolerance at 12~18V(+/-15%), exceed 22V (+/-10%) Or tolerance to specify at :

\* 2 The Clamping voltage tolerance at 12~18V(+/-15%), exceed 22V (+/-10%).

Clamping voltage measured at standard current (A) :

\* 3 The Peak Current was tested at 8/20 us waveform

\* 4. The capacitance value and Energy only for customer reference, it's not formal specification

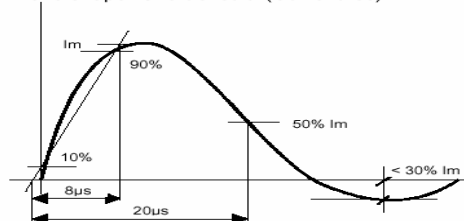
Capacitance value measured at standard frequency :

0402

## SURGE LEVEL IEC61000-4-5

| Severity Level | (kV)    |
|----------------|---------|
| 1              | 0,5     |
| 2              | 1       |
| 3              | 2       |
| 4              | 4       |
| X              | Special |

Wave shape "Short circuit" (Current Isc)



| Wave during     | T1    | T2      |
|-----------------|-------|---------|
| 8/20 μs         | 8 μs  | 20 μs   |
| 10/700 μs CCITT | 10 μs | 700 μs  |
| 10/1000 μs      | 10 μs | 1000 μs |

## REFERENCE DATA

|                                                               |            |   |          |    |
|---------------------------------------------------------------|------------|---|----------|----|
| Response time                                                 | $T_{rise}$ | < | 1        | ns |
| Leakage current at $V_v \times 80\%$                          | $I_{vv}$   | < | 50       | μA |
| Leakage current at $V_v \times 80\%$ (After reliability Test) | $I_{vva}$  | < | 200      | μA |
| Operating ambient temperature                                 |            |   | -40~+85  | °C |
| Storage temperature                                           |            |   | -50~+125 | °C |
| Max. temperature solder                                       |            |   | 260      | °C |

## OTHER DATA

|                        |              |
|------------------------|--------------|
| Body                   | ZnO          |
| End termination        | Ag/Ni/Sn     |
| Packaging              | Reel         |
| Complies with Standard | IEC61000-4-5 |
| Procedure              | Solgel       |
| Marking                | None         |

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Kunde / customer :

Artikelnummer / part number : **82.537.259**

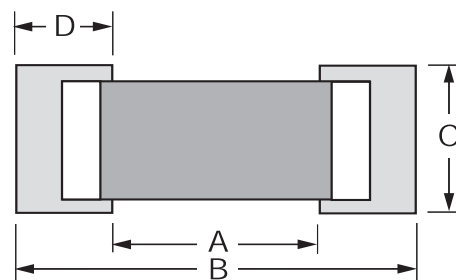
Bezeichnung :

description : **0402 SMD VARISTOR**SMD size: **0402****C Lötpad / soldering spec. :**

## RECOMMENDED SOLDER PAD LAYOUT

(Unit : mm)

| SISE | A       | B        | C       | D       |
|------|---------|----------|---------|---------|
| 402  | 0.4~0.6 | 1.0~1.8  | 0.6~0.7 | 0.6~1.2 |
| 603  | 0.8~1.2 | 1.7~3.0  | 1.2~1.6 | 0.9~1.8 |
| 805  | 1.0~1.5 | 2.1~3.8  | 1.5~2.1 | 1.1~2.3 |
| 1206 | 1.8~2.5 | 3.0~5.8  | 1.8~2.6 | 1.2~3.3 |
| 1210 | 1.8~2.5 | 3.2~6.1  | 2.8~3.8 | 1.3~3.5 |
| 1812 | 2.5~3.5 | 4.0~7.3  | 3.3~4.5 | 1.5~3.8 |
| 2220 | 3.5~4.6 | 5.0~8.5  | 5.2~6.2 | 1.5~3.9 |
| 3220 | 5.2~6.4 | 9.5~10.8 | 5.6~6.0 | 2.0~2.8 |



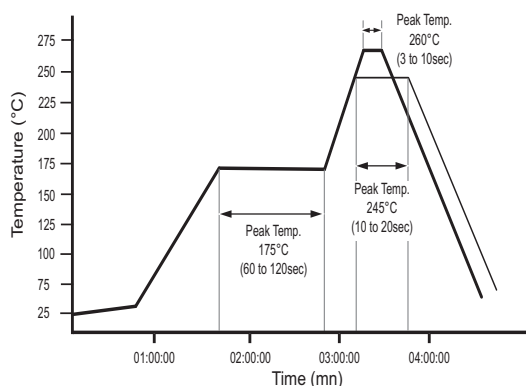
- 1 - The solder paste shall be printed in a thickness of 150 to 200µm.
- 2 - The SIR test of the solder paste shall be done (Based on JIS-Z-3284)
- 3 - IR reflow Pb Free Process suggestin profile (Based on J-STD-020-C):

Rapid heating, partial heating or rapid cooling will easily cause defect of the component. So preheating and gradual cooling process is suggested. IR soldering has the highest yields due to controlled heating rates and solder liquidus times. Make sure that the element is not subjected to a thermal gradient steeper than 3 degrees per second. 2 degrees per second is the ideal gradient. During the soldering process, pre- heating to within 175 degrees of the solders peak temperature is essential to minimize thermal shock.

Soldering recommend paste is Sn 96.5/Ag 3.5

- Preheat
  - 1.The temperature rising speed is suggested to be 2~3°C/s.
  - 2.Appropriate preheat time will be from 60 to 120 seconds.
  - 3.Temp. maintain at 175 +/-25°C 120 seconds.
- Heating
  - 1.Careful about sudden rise in temperature as it may worsen the solder ability.
  - 2.Set the peak temperature in 235°C 10-20s or 260°C 3-10s.
- Cooling
  - 1.Ramp down rate 6°C/s max.

※Perform adequate test in advance as the reflow temperature profile will vary according to the conditions of the manufacturing process, and the specification of the reflow furnace

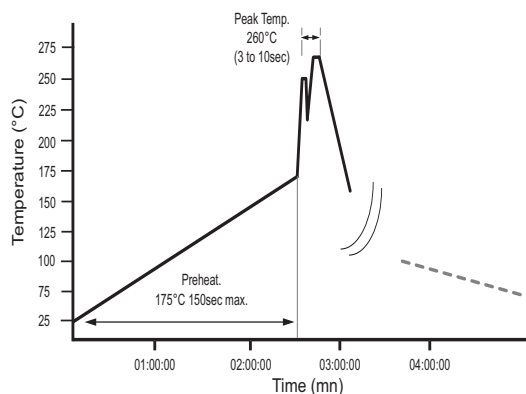


## 4 - Wave Soldering Process

Ramp-up rate 3°C/s max.  
 Temp. maintain at 175 +/-25°C 180 seconds max.  
 Peak temperature 260°C 3-10s.  
 Ramp down rate 6°C/s max.  
 to thermal shock, a preheat is recommended in the soldering process. and the peak temperature should be under controlled rigidly in the solder process.

## 5 - Hand Soldering Process

Preheating 150°C  
 Temperature of soldering iron tip 380°C max. 3 to 5 sec  
 The Varistors shall be cooled gradually at room ambient temperature



## 6 - Ultrasonic cleaning

For preventing failures or damages. Frequency 29MHz max - radiated Power 20W/l max - Period 5mn max

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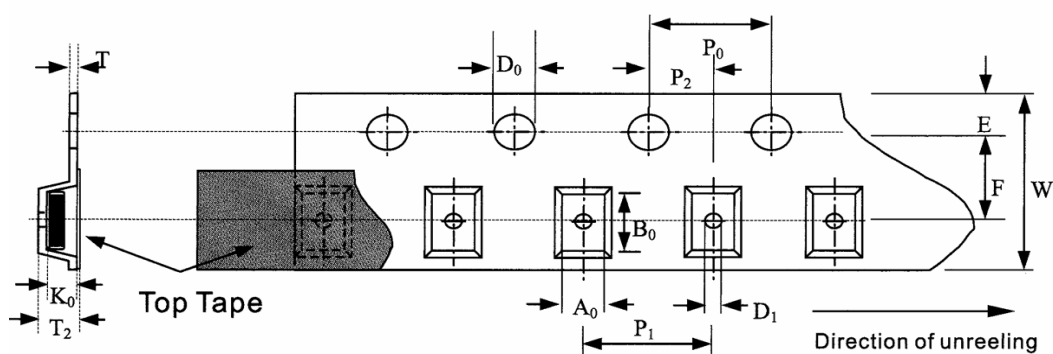
Artikelnummer / part number : **82.537.259**

Bezeichnung :

description : **0402 SMD VARISTOR**SMD size: **0402****D Rollenspezifikation / tape and reel specification :**

- 1 - Carrier tape and transparent cover tape should be heat-sealed to carry the products, and the reel should be used to reel the carrier tape.
- 2 - The adhesion of the heat-sealed cover tape shall be  $40 \pm 20 / - 15$ grams.
- 3 - Both the head and the end portion of the taping shall be empty for reel package and SMT auto-pickup machine.  
And a normal paper tape shall be connected in the head of taping for the operator to handle.

(Unit : mm)



## TAPE SPECIFICATION

(Unit : mm)

| Symbol      | A <sub>0</sub> | B <sub>0</sub> | K <sub>0</sub> | T <sub>2</sub> | T     | D <sub>0</sub> | D <sub>1</sub> | P <sub>1</sub> | P <sub>2</sub> | P <sub>0</sub> | W     | E     | F     |
|-------------|----------------|----------------|----------------|----------------|-------|----------------|----------------|----------------|----------------|----------------|-------|-------|-------|
|             | ±0.10          | ±0.10          | ±0.10          | ±0.05          | ±0.05 | +0.10<br>-0.00 | ±0.05          | ±0.10          | ±0.05          | ±0.05          | ±0.20 | ±0.10 | ±0.05 |
| <b>402</b>  | 0.85           | 1.25           | 0.65           | 0.22           | 0.10  | 1.50           | 1.00           | 4.00           | 2.00           | 4.00           | 8.00  | 1.75  | 3.50  |
| <b>603</b>  | 1.05           | 1.88           | 0.95           | 0.22           | 0.10  | 1.50           | 1.00           | 4.00           | 2.00           | 4.00           | 8.00  | 1.75  | 3.50  |
| <b>805</b>  | 1.42           | 2.30           | 1.04           | 0.22           | 0.10  | 1.50           | 1.00           | 4.00           | 2.00           | 4.00           | 8.00  | 1.75  | 3.50  |
| <b>1206</b> | 1.88           | 3.50           | 1.27           | 0.2            | 0.10  | 1.50           | 1.00           | 4.00           | 2.00           | 4.00           | 8.00  | 1.75  | 3.50  |
| <b>1210</b> | 2.18           | 3.46           | 1.45           | 0.22           | 0.10  | 1.50           | 1.00           | 4.00           | 2.00           | 4.00           | 8.00  | 1.75  | 3.50  |
| <b>1812</b> | 3.66           | 4.95           | 1.74           | 0.25           | 0.10  | 1.50           | 1.50           | 8.00           | 2.00           | 4.00           | 12.00 | 1.75  | 5.50  |
| <b>2220</b> | 5.10           | 5.97           | 2.80           | 0.25           | 0.10  | 1.50           | 1.50           | 8.00           | 2.00           | 4.00           | 12.00 | 1.75  | 5.50  |

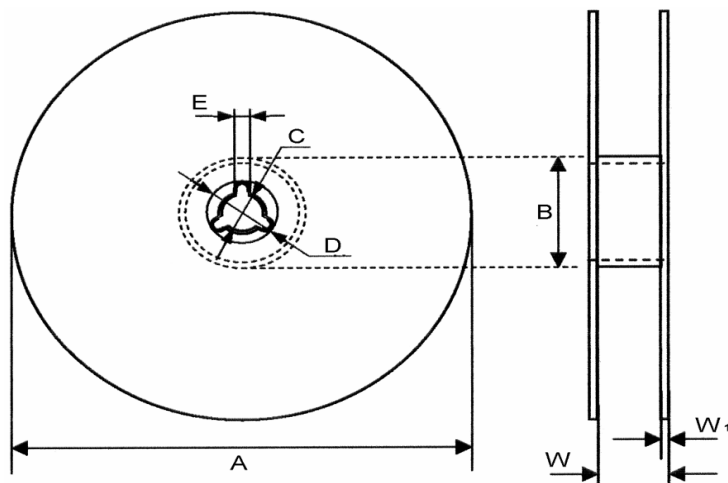
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(Unit : mm)



REEL DIMENSION

(Unit : mm)

| Symbol      | A         | B        | C        | D        | E       | W        | W <sub>1</sub> |
|-------------|-----------|----------|----------|----------|---------|----------|----------------|
| <b>402</b>  | 178.0±1.0 | 60.0±0.5 | 13.0±0.2 | 21.0±0.2 | 2.0±0.5 | 9.0±0.50 | 1.5±0.15       |
| <b>603</b>  | 178.0±1.0 | 60.0±0.5 | 13.0±0.2 | 21.0±0.2 | 2.0±0.5 | 9.0±0.50 | 1.5±0.15       |
| <b>805</b>  | 178.0±1.0 | 60.0±0.5 | 13.0±0.2 | 21.0±0.2 | 2.0±0.5 | 9.0±0.50 | 1.5±0.15       |
| <b>1206</b> | 178.0±1.0 | 60.0±0.5 | 13.0±0.2 | 21.0±0.2 | 2.0±0.5 | 9.0±0.50 | 1.5±0.15       |
| <b>1210</b> | 178.0±1.0 | 60.0±0.5 | 13.0±0.2 | 21.0±0.2 | 2.0±0.5 | 9.0±0.50 | 1.5±0.15       |
| <b>1812</b> | 178.0±1.0 | 60.0±0.5 | 13.5±0.1 | 21.0±0.2 | 2.0±0.5 | 13.6±0.2 | 1.5±0.15       |
| <b>2220</b> | 178.0±1.0 | 60.0±0.5 | 13.5±0.1 | 21.0±0.2 | 2.0±0.5 | 13.6±0.2 | 1.5±0.15       |

\*

\* 2.0 mm for 361 and 391

\* 2.5 mm for 431 and 471

QUANTITY PER PACKING UNIT

| Type            | 402    | 603   | 805   | 1206  | 1210  | 1812  | 2220  |
|-----------------|--------|-------|-------|-------|-------|-------|-------|
| <b>Pcs/reel</b> | 10 000 | 4 000 | 3 000 | 3 000 | 2 000 | 1 000 | 1 000 |

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description : 0402 SMD VARISTOR

SMD size: 0402

**E Testbedingungen / test conditions :**

## BASIC TEST

| Characteristics          | Test Method/Description                                                                                                                                                                      |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Standard Test Condition  | Environmental condition under which every measuring is done without doubt on the measuring results. Unless specially specified, temperature, relative humidity are 5 to 35°C, 45 to 85 % RH. |
| Max. Working Voltage     | Maximum steady-state DC operating voltage the device can maintain and typical leakage current at 25°C not exceed 50 µA.                                                                      |
| Varistor Voltage         | With the specified measuring current of 1mA DC applied.                                                                                                                                      |
| Max. Clamping Voltage    | Maximum peak voltage across the TVS measured at a specified pulse current (A) and waveform 8/20µs.                                                                                           |
| Surge Current            | Maximum peak current which may be applied with the specified waveform 8/20µs without device failure.                                                                                         |
| Surge Shift $\Delta V/V$ | The shift of TVS voltage after suffering the specified surge current.                                                                                                                        |
| Energy Absorption        | Maximum energy which may be dissipated with a specified waveform 10/1000µs without device failure.                                                                                           |
| Typical Capacitance      | Device Capacitance measured with zero voltage bias 0.5VRMS and 1KHZ                                                                                                                          |
| Leakage Current          | Typical leakage current at 25°C < 50µA                                                                                                                                                       |

## ENVIRONMENTAL RELIABILITY TEST

| Characteristic               | Test method and description                                                                                                                                                                                                                                                                        |                  |             |        |   |        |         |   |                  |           |   |       |         |   |             |           |
|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-------------|--------|---|--------|---------|---|------------------|-----------|---|-------|---------|---|-------------|-----------|
| High Temperature Storage     | The specimen shall be subjected to 125 ± 2℃ for 1000 ± 12 hours in a thermostatic bath without load and then stored at room temperature and humidity for 1 to 2 hours. The change of varistor voltage shall be within 10 % .                                                                       |                  |             |        |   |        |         |   |                  |           |   |       |         |   |             |           |
| Temperature Cycle            | The temperature cycle of specified temperature shall be repeated five times and then stored at room temperature and humidity for one or two hours. the change of varistor voltage shall be within 10 %and mechanical damage shall be examined.                                                     |                  |             |        |   |        |         |   |                  |           |   |       |         |   |             |           |
| High Temperature Load        | <table><tr><th>Step</th><th>Temperature</th><th>Period</th></tr><tr><td>1</td><td>-40±3℃</td><td>30Min±3</td></tr><tr><td>2</td><td>Room Temperature</td><td>1~2 hours</td></tr><tr><td>3</td><td>85±2℃</td><td>30Min±3</td></tr><tr><td>4</td><td>Temperature</td><td>1~2 hours</td></tr></table> | Step             | Temperature | Period | 1 | -40±3℃ | 30Min±3 | 2 | Room Temperature | 1~2 hours | 3 | 85±2℃ | 30Min±3 | 4 | Temperature | 1~2 hours |
|                              | Step                                                                                                                                                                                                                                                                                               | Temperature      | Period      |        |   |        |         |   |                  |           |   |       |         |   |             |           |
|                              | 1                                                                                                                                                                                                                                                                                                  | -40±3℃           | 30Min±3     |        |   |        |         |   |                  |           |   |       |         |   |             |           |
|                              | 2                                                                                                                                                                                                                                                                                                  | Room Temperature | 1~2 hours   |        |   |        |         |   |                  |           |   |       |         |   |             |           |
|                              | 3                                                                                                                                                                                                                                                                                                  | 85±2℃            | 30Min±3     |        |   |        |         |   |                  |           |   |       |         |   |             |           |
| 4                            | Temperature                                                                                                                                                                                                                                                                                        | 1~2 hours        |             |        |   |        |         |   |                  |           |   |       |         |   |             |           |
|                              | After being continuously applied the maximum allowable voltage at 85 ± 2℃ for 1000± 2 hours, the specimen shall be stored at room temperature and humidity for one or two hours, the change of varistor voltage shall be within 10 % .                                                             |                  |             |        |   |        |         |   |                  |           |   |       |         |   |             |           |
|                              |                                                                                                                                                                                                                                                                                                    |                  |             |        |   |        |         |   |                  |           |   |       |         |   |             |           |
|                              |                                                                                                                                                                                                                                                                                                    |                  |             |        |   |        |         |   |                  |           |   |       |         |   |             |           |
|                              |                                                                                                                                                                                                                                                                                                    |                  |             |        |   |        |         |   |                  |           |   |       |         |   |             |           |
| Damp Heat Load/Humidity Load | The specimen should be subjected to 40 ± 2℃, 90 to 95 % RH environment , and the maximum allowable voltage applied for 1000 hours, then stored at room temperature and humidity for one or two hours. the change of varistor voltage shall be within 10%                                           |                  |             |        |   |        |         |   |                  |           |   |       |         |   |             |           |
| Low Temperature Storage      | The specimen should be subjected to 40 ± 2℃, without load for 1000 hours and then stored at room temperature for one or two hours. the change of varistor voltage shall be within 10 %                                                                                                             |                  |             |        |   |        |         |   |                  |           |   |       |         |   |             |           |

|                                        |                          |                         |            |                       |                         |
|----------------------------------------|--------------------------|-------------------------|------------|-----------------------|-------------------------|
| Freigabe erteilt /<br>general release: | Kunde / customer         |                         |            |                       |                         |
| Datum / date                           | Unterschrift / signature |                         | JP. PENLOU | High Temperature Load | 06-07-31                |
|                                        | Würth Elektronik         |                         | JP. PENLOU | New P/N               | 06-06-02                |
|                                        |                          |                         | JP. PENLOU | Operating temp. Range | 05-11-30                |
|                                        |                          |                         | JP. PENLOU | Lead free soldering   | 05-11-04                |
| Geprüft / checked                      | 2006-06-02               | Kontrolliert / approved | JP. Penlou | Name                  | Änderung / modification |
|                                        |                          |                         |            |                       | Datum / date            |

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