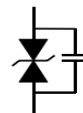
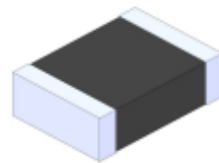


## 3220 Series

### Features

- u Varistor voltage from 33V to 470V
- u Fast response time (<1nS )
- u Low leakage current
- u High transient current capability
- u Low clamping voltage
- u Wide operating temperature range from -40~85 °C
- u Meet IEC 61000-4-2/-5 level standard
- u Compact size for ELA 3220

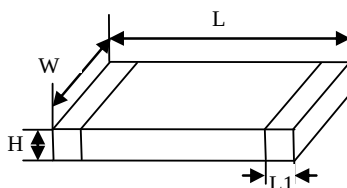


### Applications

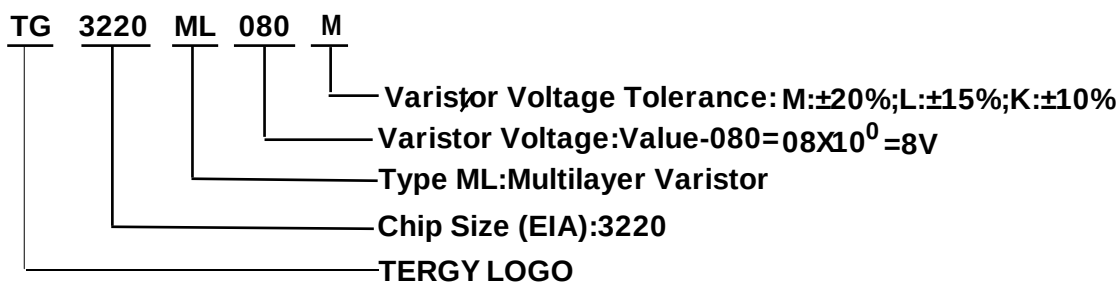
- u For Mother Board and Notebook, Cellular Phone, handheld device, CMS, MSFET, EFT etc

### Dimensions Unit: mm

| Model           | 1005(0402) | 1608(0603) | 2012(0805) | 3216(1206) | 3225(1210) | 4532(1812) | 5750(2220) | 8050(3220) |
|-----------------|------------|------------|------------|------------|------------|------------|------------|------------|
| Length(L)       | 1.00±0.15  | 1.60±0.20  | 2.00±0.20  | 3.20±0.20  | 3.20±0.20  | 4.50±0.30  | 5.70±0.30  | 8.0±0.30   |
| Width(W)        | 0.50±0.15  | 0.80±0.20  | 1.20±0.20  | 1.60±0.20  | 2.50±0.20  | 3.20±0.20  | 5.00±0.30  | 5.00±0.30  |
| High(H)         | 0.70max    | 0.90max    | 1.30max    | 1.60max    | 2.50max    | 3.20max    | 4.50max    | 4.50max    |
| Termination(L1) | 0.25±0.10  | 0.30±0.20  | 0.40±0.20  | 0.50±0.20  | 0.50±0.20  | 0.60±0.20  | 0.60±0.30  | 0.60±0.30  |



### Part Number Code

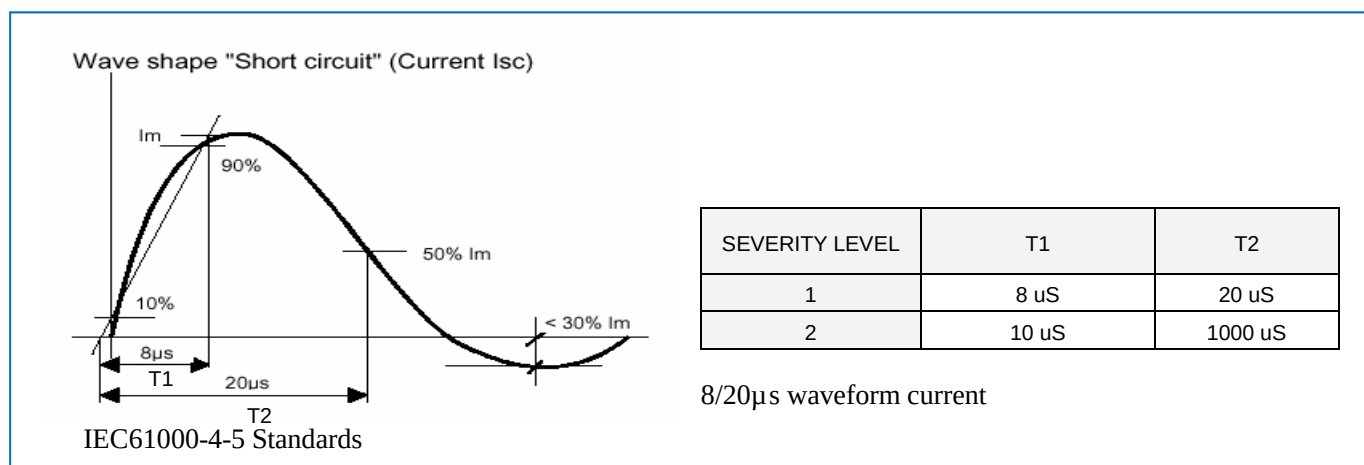


## Electrical Characteristics

## 3220 Series

| Part Number  | Working Voltage         |                        | Varistor Voltage |         | Clamping Voltage          | Peak Current                | Transient Energy               | Capacitance    |
|--------------|-------------------------|------------------------|------------------|---------|---------------------------|-----------------------------|--------------------------------|----------------|
|              | (IL < 50 $\mu$ A)       |                        | V <sub>B</sub>   |         | V <sub>C</sub>            | I <sub>P</sub>              | E <sub>T</sub>                 | C <sub>P</sub> |
|              | AC (V)                  | DC (V)                 | @1mA DC (V)      |         | @8/20 $\mu$ S<br>@10A (V) | @8/20 $\mu$ S<br>(A) (MAX.) | @10/1000 $\mu$ S<br>(J) (MAX.) | @1MHz          |
|              | V <sub>RMS</sub> (Max.) | V <sub>DC</sub> (Max.) |                  |         |                           |                             |                                |                |
| TG3220ML330K | 20                      | 26                     | 33               | 29~36   | 54                        | 500                         | 12                             | 3500           |
| TG3220ML470K | 28                      | 36                     | 47               | 42~52   | 77                        | 500                         | 12                             | 3500           |
| TG3220ML560K | 35                      | 45                     | 56               | 50~62   | 90                        | 500                         | 12                             | 3500           |
| TG3220ML680K | 40                      | 56                     | 68               | 60~75   | 110                       | 500                         | 12                             | 2500           |
| TG3220ML820K | 50                      | 65                     | 82               | 73~91   | 135                       | 500                         | 12                             | 2500           |
| TG3220ML101K | 60                      | 85                     | 100              | 90~110  | 165                       | 500                         | 12                             | 2500           |
| TG3220ML121K | 75                      | 100                    | 120              | 108~132 | 200                       | 500                         | 12                             | 1500           |
| TG3220ML151K | 95                      | 125                    | 150              | 135~165 | 250                       | 500                         | 12                             | 1500           |
| TG3220ML181K | 115                     | 150                    | 180              | 162~198 | 300                       | 500                         | 12                             | 1500           |
| TG3220ML201K | 130                     | 170                    | 205              | 184~226 | 340                       | 500                         | 12                             | 1200           |
| TG3220ML221K | 140                     | 180                    | 220              | 198~242 | 360                       | 500                         | 12                             | 1200           |
| TG3220ML241K | 150                     | 200                    | 240              | 216~264 | 395                       | 500                         | 12                             | 700            |
| TG3220ML271K | 175                     | 225                    | 270              | 243~297 | 445                       | 500                         | 12                             | 700            |
| TG3220ML361K | 230                     | 300                    | 360              | 324~396 | 595                       | 500                         | 12                             | 700            |
| TG3220ML391K | 250                     | 320                    | 390              | 351~429 | 647                       | 500                         | 12                             | 42             |
| TG3220ML431K | 275                     | 369                    | 430              | 387~473 | 705                       | 500                         | 12                             | 39             |
| TG3220ML471K | 300                     | 385                    | 470              | 423~517 | 775                       | 500                         | 12                             | 35             |

## Surge Current Standard Waveform



## General Technical Data

|                                     |                     |                              |
|-------------------------------------|---------------------|------------------------------|
| Operating Temperature               |                     | -40 ~ +85°C                  |
| Storage Temperature                 |                     | -40 ~ +125°C                 |
| Response Time                       |                     | <1 ns                        |
| Solderability                       |                     | 245 $\pm$ 5°C, 3 $\pm$ 1sec  |
| Solder leach resistance             |                     | 260 $\pm$ 5°C, 10 $\pm$ 1sec |
| Taping Package<br>Storage Condition | Storage Temperature | 5 ~ 40°C                     |
|                                     | Relative Humidity   | To 65%                       |
|                                     | Storage Time        | 12 Months max                |

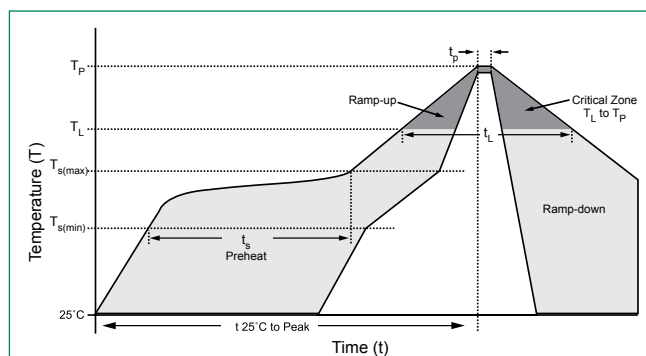
## Environmental Reliability Testing

### 3220 Series

| Characteristic                   | Test method and description                                                                                                                                                                                                                         |      |                  |          |
|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------------------|----------|
| High Temperature Storage         | The specimen shall be subjected to 125°C for 1000 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 two hours. The change of varistor voltage shall be within 10% and mechanical damage shall be examined.         | Step | Temperature      | Period   |
|                                  |                                                                                                                                                                                                                                                     | 1    | -40±3°C          | 30min±3  |
|                                  |                                                                                                                                                                                                                                                     | 2    | Room Temperature | 1~2hours |
|                                  |                                                                                                                                                                                                                                                     | 3    | 125±2°C          | 30min±3  |
| High Temperature Load            | After being continuously applied the maximum allowable voltage at 85°C for 1000hours, the specimen shall be stored at room temperature and humidity for one or hours, the change of varistor voltage shall be within 10%.                           | 4    | Room Temperature | 1~2hours |
|                                  |                                                                                                                                                                                                                                                     |      |                  |          |
| Damp Heat Load/<br>Humidity Load | The specimen should be subjected to 40°C, 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°C, without load for 1000 hours and then stored at room temperature for one two hours. The change of varistor voltage shall be within 10%.                                                                   |      |                  |          |

## Recommended Soldering Conditions

|                                                       |                                   |                    |
|-------------------------------------------------------|-----------------------------------|--------------------|
| Reflow Condition                                      |                                   | Lead-free assembly |
| Pre Heat                                              | -Temperature Min ( $T_{s(min)}$ ) | 150°C              |
|                                                       | -Temperature Max ( $T_{s(max)}$ ) | 200°C              |
|                                                       | -Time (min to max) ( $t_s$ )      | 60 – 180 secs      |
| Average ramp up rate (Liquidus Temp ( $T_L$ ) to peak |                                   | 3°C/second max     |
| $T_{s(max)}$ to $T_L$ - Ramp-up Rate                  |                                   | 5°C/second max     |
| Reflow                                                | -Temperature ( $T_L$ ) (Liquidus) | 217°C              |
|                                                       | -Time (min to max) ( $t_s$ )      | 60 – 150 seconds   |
| Peak Temperature ( $T_p$ )                            |                                   | 260 +0/-5°C        |
| Time within 5°C of actual peak Temperature ( $t_p$ )  |                                   | 20 – 40 seconds    |
| Ramp-down Rate                                        |                                   | 6°C/second max     |
| Time 25°C to peak Temperature ( $T_p$ )               |                                   | 8 minutes Max.     |



Note that this product will be easily damaged by rapid heating, rapid cooling or local heating.

Do not give heat shock over 100°C in the process of soldering. We recommend to take preheating and gradual cooling

### Soldering gun procedure

Note the follows, in case of using solder gun for replacement.

- 1) The tip temperature must be less than 280 for the period within 3 seconds by using soldering gun under 30W
- 2) The soldering gun tip shall not touch this product directly.

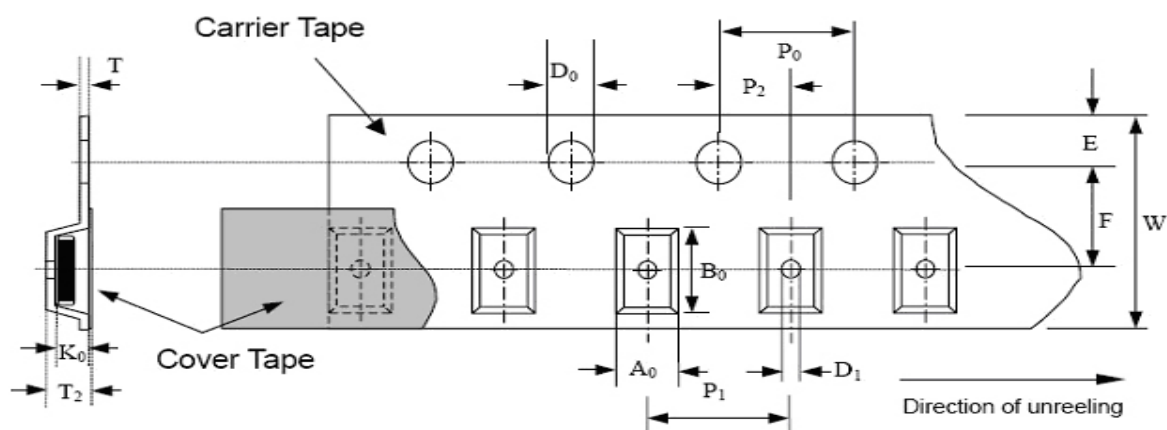
### Soldering volume

Note that excess of soldering volume will easily get crack the body of this product.

## Packaging Dementions Unit:Millimeters

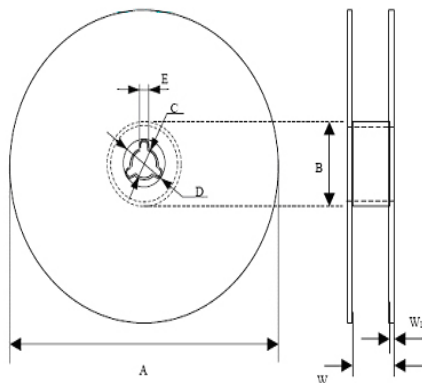
## 3220 Series

- ◆ Carrier tape transparent cover tape should be heat-sealed to carry the products, and the reel should be used to reel the carrier tape.
- ◆ The adhesion of the heat-sealed cover tape shall be  $40 \pm 20 / - 15$  grams.
- ◆ Both the head and the end portion of 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 handle.



| type | A <sub>0</sub><br>±0.10 | B <sub>0</sub><br>±0.10 | K <sub>0</sub><br>±0.10 | T<br>±0.05 | T <sub>2</sub><br>±0.05 | D <sub>0</sub><br>+0.10 | D <sub>1</sub><br>±0.05 | P <sub>1</sub><br>±0.10 | P <sub>2</sub><br>±0.05 | P <sub>0</sub><br>±0.05 | W<br>±0.20 | E<br>±0.10 | F<br>±0.05 |
|------|-------------------------|-------------------------|-------------------------|------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|------------|------------|------------|
| 0402 | 1.08                    | 1.88                    | 1.04                    | 0.22       | 0.87                    | 1.50                    | 1.00                    | 4.00                    | 2.00                    | 4.00                    | 8.00       | 1.75       | 3.50       |
| 0603 | 1.08                    | 1.88                    | 1.04                    | 0.22       | 1.17                    | 1.50                    | 1.00                    | 4.00                    | 2.00                    | 4.00                    | 8.00       | 1.75       | 3.50       |
| 0805 | 1.42                    | 2.30                    | 1.04                    | 0.22       | 1.26                    | 1.50                    | 1.00                    | 4.00                    | 2.00                    | 4.00                    | 8.00       | 1.75       | 3.50       |
| 1206 | 1.88                    | 3.50                    | 1.27                    | 0.20       | 1.49                    | 1.50                    | 1.00                    | 4.00                    | 2.00                    | 4.00                    | 8.00       | 1.75       | 3.50       |
| 1210 | 2.18                    | 3.46                    | 1.45                    | 0.22       | 1.77                    | 1.50                    | 1.00                    | 4.00                    | 2.00                    | 4.00                    | 8.00       | 1.75       | 3.50       |
| 1812 | 3.66                    | 4.95                    | 1.74                    | 0.25       | 1.99                    | 1.50                    | 1.50                    | 8.00                    | 2.00                    | 4.00                    | 12.00      | 1.75       | 5.50       |
| 2220 | 5.10                    | 5.97                    | 2.80                    | 0.25       | 3.05                    | 1.50                    | 1.50                    | 8.00                    | 2.00                    | 4.00                    | 12.00      | 1.75       | 5.50       |
| 3220 | 5.50                    | 8.50                    | 2.80                    | 0.30       | 3.50                    | 1.50                    | 1.50                    | 8.00                    | 2.00                    | 4.00                    | 16.00      | 1.75       | 7.50       |

## Reel Dimensions Unit:Millimeters



| Type          | A     | B      | C             | D      | E     | W             | W <sub>1</sub> |
|---------------|-------|--------|---------------|--------|-------|---------------|----------------|
| 0402~<br>1210 | 178±1 | 60±0.5 | 13±0.2        | 21±0.2 | 2±0.5 | 9±0.5         | 1.5±0.15       |
| 1812~<br>3220 | 178±1 | 60±0.5 | 13.5 ±<br>0.2 | 21±0.2 | 2±0.5 | 13.6 ±<br>0.5 | 1.5±0.15       |

## Packing Quantity

| Type     | 0402  | 0603 | 0805 | 1206 | 1210 | 1812 | 2220 | 3220 |
|----------|-------|------|------|------|------|------|------|------|
| Quantity | 10000 | 4000 | 4000 | 3000 | 3000 | 1000 | 1000 | 1000 |