# SMD metal oxide varistors

SMD varistors, Standard, 3225 series

**Series/Type: VCRR3225***K***
Orderingcode:VCRR3225***K***

**Date:** **January 2020**
Version: 1

## Features

- Improved component design in a compact case
- High surge current capability of up to 250A-1000A
- Superior performance at high temperature
- White package design without shadow in LED lighting application
- SMD mountable disk varistors, suitable for lead-free reflow / wave soldering

## Applications

- Power supplies for telecommunication systems
- Protection for LED circuits
- Protection for consumer, industrial equipment
- Protection for automotive electronics

## Type Code Designation

| VCRR | 3225 | - | 471 | K |
|---|---|---|---|---|
| Logo | Size<br><br>2220(5750)<br>3220(8050)<br>3225(8060)<br>4032(1008) | Separate | Varistor voltage<br><br>180=18V<br>471=470V<br>102=1000V | <br><br>J: ±5%<br>K: ±10% |

## Internal Chip Size

| Page Size | Chip Size | Page Size | Chip Size |
|---|---|---|---|
| 2220 | 4*4mm | 3225 | 5*5mm |
| 3220 | 5*5mm | 4032 | 7*7mm |

## General Technical Data

| Parameter | Value | Unit |
|---|---|---|
| Operating temperature | -55 to +125 | C |
| Storage temperature | -55 to +150 | C |
| Electric strength | ≥2.5 | $kV_{RMS}$ |
| Insulation resistance | ≥100 | MQ |

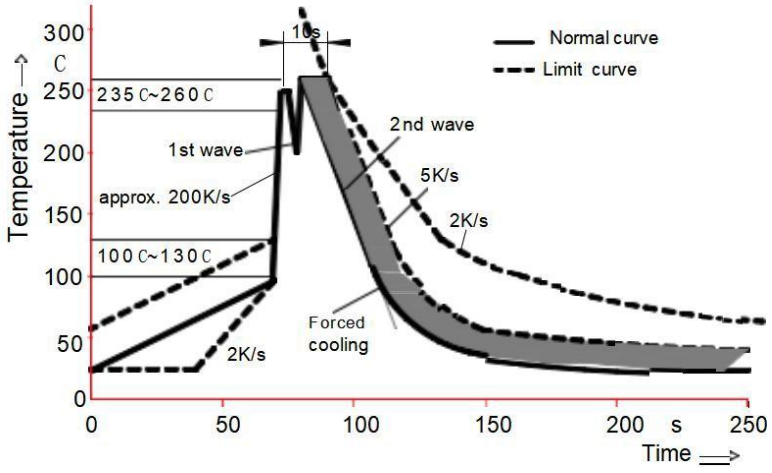
## Electrical Characteristics

| Part Number | Maximum Allowable Voltage | | Varistor Voltage | Maximum Clamping Voltage | | Withstanding Surge Current | Energy 10/1000 μS | | Rated Powe | Typical Capacitance (Reference) |
|---|---|---|---|---|---|---|---|---|---|---|
| Standard | AC (V) | DC (V) | V0.1mA(V) | IP(A) | VC(V) | I(A) Standard | (J) Standard | (J) High Surge | (W) | @ 1 KHzPF |
| 3225-180 K | 11 | 14 | 18( 15.3~20.7) | 2.5 | 36 | 250 | 0.9 | 2.0 | 0.02 | 2800 |
| 3225-220 K | 14 | 18 | 22( 19.8~24.2) | 2.5 | 43 | 250 | 1.1 | 2.4 | 0.02 | 2300 |
| 3225-270 K | 17 | 22 | 27(24.3-29.7) | 2.5 | 53 | 250 | 1.4 | 3.0 | 0.02 | 1800 |
| 3225-330K | 20 | 26 | 33(29.7~36.3) | 2.5 | 65 | 250 | 1.7 | 3.5 | 0.02 | 1500 |
| 3225-390 K | 25 | 31 | 39(35.1~42.9) | 2.5 | 77 | 250 | 2.1 | 4.0 | 0.02 | 1300 |
| 3225-470K | 30 | 38 | 47(42.3~51.7) | 2.5 | 93 | 250 | 2.5 | 5.0 | 0.02 | 1100 |
| 3225-560K | 35 | 45 | 56(50.4~61.6) | 2.5 | 110 | 250 | 3.1 | 6.0 | 0.02 | 890 |
| 3225-680K | 40 | 56 | 68(61.2~74.8) | 2.5 | 135 | 250 | 3.6 | 7.0 | 0.02 | 740 |
| 3225-820K | 50 | 65 | 82(73.8~90.2) | 10 | 135 | 1200 | 5.5 | 10 | 0.25 | 600 |
| 3225-101K | 60 | 85 | 100(90~110) | 10 | 165 | 1200 | 6.5 | 12 | 0.25 | 500 |
| 3225-121 K | 75 | 100 | 120( 108~132) | 10 | 200 | 1200 | 7.8 | 12 | 0.25 | 420 |
| 3225-151K | 95 | 125 | 150( 135~165) | 10 | 250 | 1200 | 9.7 | 13 | 0.25 | 330 |
| 3225-181K | 115 | 150 | 180( 162~198) | 10 | 300 | 1200 | 11.7 | 16 | 0.25 | 280 |
| 3225-201K | 130 | 170 | 200( 185~225) | 10 | 330 | 1200 | 13 | 17 | 0.25 | 250 |
| 3225-221K | 140 | 180 | 220( 198~242) | 10 | 360 | 1200 | 14 | 19 | 0.25 | 230 |
| 3225-241K | 150 | 200 | 240(216~264) | 10 | 395 | 1200 | 15 | 21 | 0.25 | 210 |
| 3225-271K | 175 | 225 | 270(243~297) | 10 | 455 | 1200 | 18 | 24 | 0.25 | 185 |
| 3225-301K | 190 | 250 | 300(270~330) | 10 | 505 | 1200 | 20 | 26 | 0.25 | 165 |
| 3225-331K | 210 | 275 | 330(297~363) | 10 | 550 | 1200 | 23 | 28 | 0.25 | 150 |
| 3225-361K | 230 | 300 | 360(324~396) | 10 | 595 | 1200 | 25 | 32 | 0.25 | 140 |
| 3225-391K | 250 | 320 | 390(351~429) | 10 | 650 | 1200 | 25 | 35 | 0.25 | 130 |
| 3225-431K | 275 | 350 | 430(387~473) | 10 | 710 | 1200 | 28 | 40 | 0.25 | 110 |
| 3225-471K | 300 | 385 | 470(423~517) | 10 | 775 | 1200 | 30 | 42 | 0.25 | 105 |
| 3225-511K | 320 | 415 | 510(459~561) | 10 | 845 | 1200 | 30 | 45 | 0.25 | 100 |
| 3225-561K | 350 | 460 | 560(504~616) | 10 | 920 | 1200 | 30 | 49 | 0.25 | 90 |
| 3225-621K | 385 | 505 | 620(558~682) | 10 | 1025 | 1200 | 33 | 55 | 0.25 | 80 |
| 3225-681K | 420 | 560 | 680(612~748) | 10 | 1120 | 1200 | 33 | 60 | 0.25 | 75 |
| 3225-751K | 460 | 615 | 750(675~825) | 10 | 1240 | 1200 | 65 | 67 | 0.25 | 70 |
| 3225-781K | 485 | 640 | 780(702~858) | 10 | 1290 | 1200 | 65 | 67 | 0.25 | 70 |
| 3225-821K | 510 | 670 | 820(738~902) | 10 | 1355 | 1200 | 65 | 70 | 0.25 | 60 |

## Soldering Guidelines

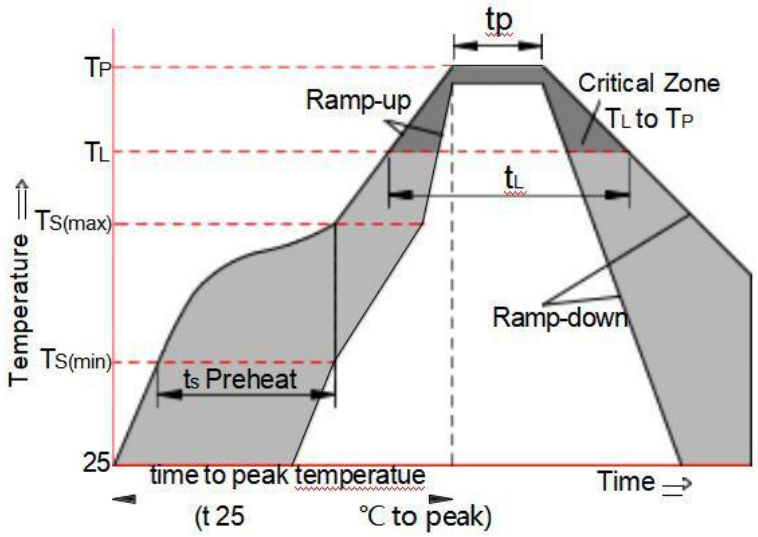
The usage of mild, non-activated fluxes for soldering is recommended, as well as proper cleaning of the PCB.
The components are suitable for reflow soldering per JEDEC J-STD-020C.

### Wave Soldering




Temperature characteristics at component terminal with dual-wave soldering

## Reflow Soldering



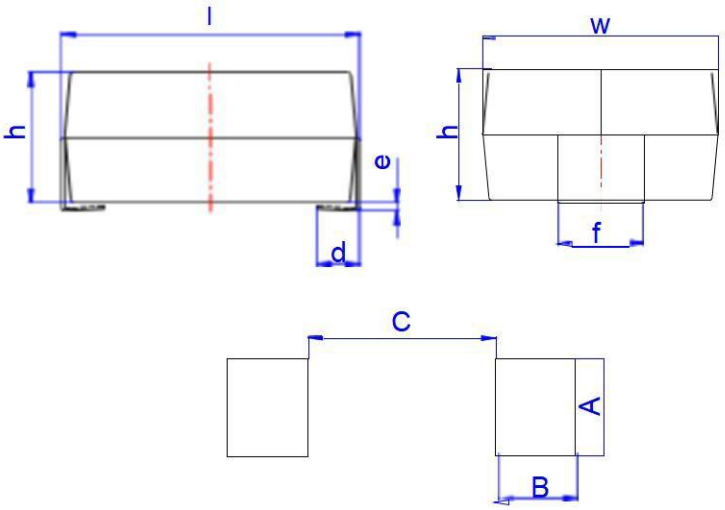

| Profile feature | | Sn-Pb assembly | Pb-Free assembly |
|---|---|---|---|
| Average ramp-up rate ($T_{Smax}$ to $T_p$) | | 3 ℃/ sec. Max | 3 ℃/ sec. Max |
| Preheat | -Temperature min. ($T_{s(min)}$) | + 10 0 ℃ | + 15 0 ℃ |
| | -Temperature max.($T_{s(max)}$) | + 15 0 ℃ | + 20 0 ℃ |
| | -Time ($t_{Smin}$ to $t_{Smax}$) | 60-120 secs. | 60-180 secs. |
| $T_{s(max)}$ to $T_L$ - Ramp-up Rate | | 3 ℃/ sec. Max | 3 ℃/ sec. Max |
| Time maintained above | -Temperature min. ($T_L$) | + 18 3 ℃ | + 21 7 ℃ |
| | -Time ($t_L$) | 60-150 secs. | 60-150 secs. |
| Peak classification temperature ($T_p$) | | +220 ℃ to +240℃ | +240 ℃ to +260℃ |
| Time within 5℃of actual peak temperature ($t_p$) | | 10 secs. to 30 secs. | 20 secs. to 40 secs. |
| Ramp-down rate | | 6 ℃/ sec. max. | 6 ℃/ sec. max. |
| Time 25℃ to peak temperature | | 6 min. max. | 8 min. max. |

Notes: All temperature refer to topside of the package, measured on the package body surface
Maximum number of reflow cycles: 3

## Storage Condition

- As far as possible, the components should be employed within 24 months after delivery from Kangtai Semiconductor.
- They should be left in their original packing to avoid soldering problems due to oxidized contacts.
- Storage temperature: − 25 up to + 45°C.
- Relative humidity: < 75 % annual average, < 95 % on max. 30 days in a year.

## Dimensional Drawings

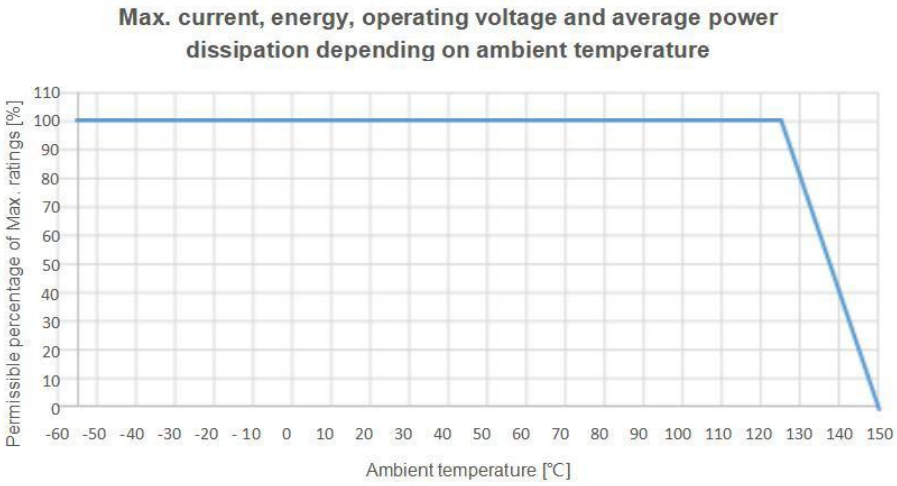



| Ref. | Dimensions | | | | | |
|---|---|---|---|---|---|---|
| | Millimeters | | | Inches | | |
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| l | 7.7 | | 8.3 | 0.303 | | 0.327 |
| w | 6.0 | | 6.6 | 0.236 | | 0.260 |
| h | 3.3 | | 4.0 | 0.122 | | 0.150 |
| d | 1.2 | | 1.8 | 0.047 | | 0.071 |
| e | 0 | | 0.3 | 0 | | 0.012 |
| f | 2.70 | | 3.3 | 0.106 | | 0.130 |
| A | | 3.5 | | | 0.138 | |
| B | | 2.8 | | | 0.110 | |
| C | | 4.5 | | | 0.177 | |

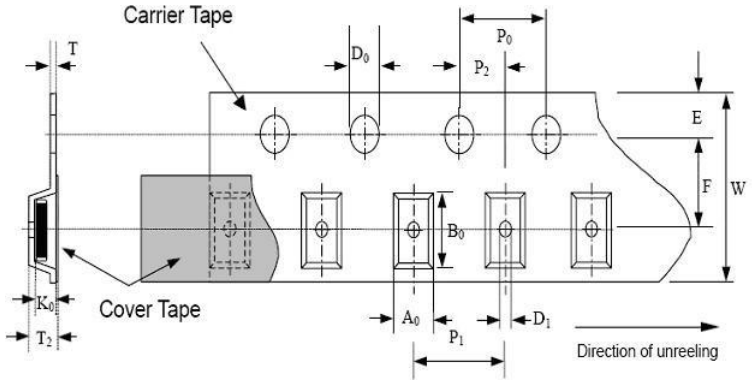



Recommended solder pad layout

## Temperature Rating Curve

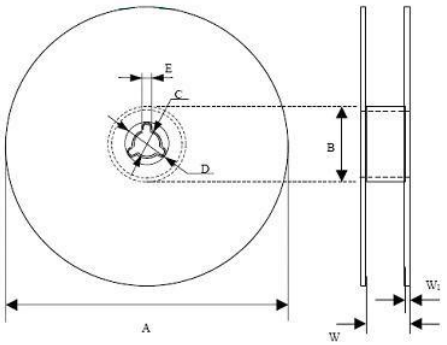


## Packaging Specification




| Type | $A_0$ ±0.20 | $B_0$ ±0.20 | $K_0$ ±0.10 | T max | $T_2$ max | $D_0$ +0.05 | $D_1$ ±0.05 | $P_1$ ±0.10 | $P_2$ ±0.05 | $P_0$ ±0.1 | W ±0.30 | E ±0.10 | F ±0.05 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3225 | 7.0 | 8.7 | 3.85 | 0.3 | 5.50 | 1.55 | 1.55 | 12.00 | 2.00 | 4.00 | 16.00 | 1.75 | 7.50 |
| 4032 | 8.4 | 10.8 | 3.85 | 0.3 | 5.50 | 1.55 | 1.55 | 12.00 | 2.00 | 4.00 | 24.00 | 1.75 | 11.50 |

## Reel dimension




| Type | A | B | C | D | E | W-W1 | $W_1$ |
|---|---|---|---|---|---|---|---|
| 3225 | 329.0±1.0 | 60.0±0.5 | 13.0±0.2 | 21.0±0.2 | 2.0±0.5 | 17.2±0.7 | 2.3±0.15 |

Quantity of taping packing(pcs) : 1000