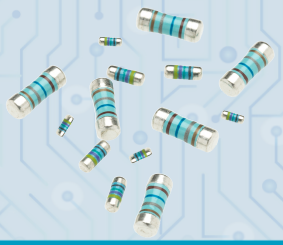


# ZCM Series Datasheet

## SMD Precision Metal Film Resistors | MELF Style

## ORDERING CODE-Example

**New SAP Part Nr.:**

| ZCM | 207 | F | K | E | 07- | 1K | AA |
|---|---|---|---|---|---|---|---|
| Serie | Power rating | Tol. | Pack-Code | TCR | Forming type | R Value | Special |
| | 102 = 0,2W<br>204 = 0,4W<br>207 = 1,0W | **B** = ±0,1%<br>**C** = ±0,25%<br>**D** = ±0,5%<br>**F** = ±1%<br>**G** = ±2%<br>**J** = ±5%<br>**-** = Jumper | **K** = Blister tape reel | **C** = ±15ppm<br>**D** = ±25ppm<br>**E** = ±50ppm<br>**F** = ±100ppm<br>**-** = Jumper | **07-** = 07 inch (Reel diameter)<br>or<br>**13-** = 13 inch (Reel diameter) | **0R** = Jumper | **AA** = Standard |

**Historical VTM Part Nr.:**

| ZC | 0207 | F | K | E | 07 | 1K |
|---|---|---|---|---|---|---|
| Type | Size | Tol. | K = Blister tape reel | TC | Reel diam. | R Value |

## APPLICATIONS

- Automotive
- Alternative Energy
- Home Appliances
- Charger
- Power Supply
- Industrial

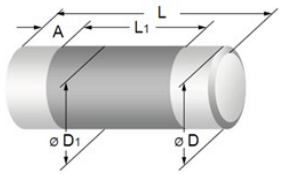
## FEATURES

- Precision MELF resistor
- Advanced MELF technology
- Excellent stability in different environmental conditions
- Best in class pulse load capability
- AEC – Q200 Qualified
- Intrinsic sulfur resistance
- RoHs & REACH Compliant

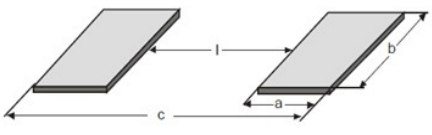
## ELECTRICAL SPECIFICATIONS

| Type | | ZCM102 | ZCM204 | ZCM207 |
|---|---|---|---|---|
| Historical Part Number | SMD | - | ZC0204 | ZC0207 |
| Nominal Power Rating $P_{70}$ | [W] | 0,2 | 0,4 | 1,0 |
| Resistance Range (Other values upon request) | [Ω] Min | 10R | 0R22 | 0R16 |
| | [Ω] Máx | 2M21 | 10M | 10M |
| E-Series | | E24 / E96 / E192 | | |
| Tolerances | ±[%] | B = 0,1%, F = 1% | B = 0,1% , C = 0,25% , D = 0,5% , F = 1% , G = 2% , J = 5% | |
| Temperature Coefficient *IEC60115-1 clause 4.2 ; 4.8 (+20 / -55[°C] and (+20 / +125[°C])* | $\pm[10^{-6}K^{-1}]$ | Depends on the value, please check the table below | | |
| Working Temperature Range | [ºC] | -55 … +125 | -55 … +155 | |
| Permissible film temperature *(ϑF max.)* | [ºC] | 125 | 155 | |
| Max. Working Voltage | $[AC\ or\ DC]_{RMS}$ | 150 | 200 | 350 |
| Dielectric Withstanding Voltage IEC115-1 clause 4.7 (1[min]) | $[V]_{RMS}$ | 200 | 300 | 500 |

## DIMENSIONS [mm]




| *Type* | *Historical P/N:* | *L* | *Ø D* | *$L_1$* | *Ø $D_1$* | *A* | *MASS (mg)* |
|---|---|---|---|---|---|---|---|
| **ZCM102** | - | $2,2^{+0/-0,15}$ | $1,1^{+0/-0,1}$ | $1,2^{min.}$ | $D^{+0/-0,1}$ | $0,40^{\pm0,05}$ | 7 |
| **ZCM204** | ZC0204 | 3,6 +0 /-0,2 | 1,4 +0 /-0,1 | 1,8 min. | D +0 /-0,15 | 0,80 ±0,10 | 22 |
| **ZCM207** | ZC0207 | 5,8 +0 /-0,3 | 2,2 ±0,2 | 2,6 min. | D +0 /-0,2 | 1,25 ±0,2 | 77 |




| Recommended solder pads dimensions | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| *Type* | Wave soldering | | | | Reflow soldering | | | |
| | *l* | *a* | *b* | *c* | *l* | *a* | *b* | *c* |
| **ZCM102** | 0.7 | 1.2 | 1.5 | 3.1 | 1.1 | 0.8 | 1.3 | 2.7 |
| **ZCM204** | 1,5 | 1,5 | 1,8 | 4,5 | 1,7 | 1,2 | 1,6 | 4,1 |
| **ZCM207** | 2,4 | 2,3 | 2,6 | 7,0 | 2,6 | 2,0 | 24 | 6,6 |

File Nr. 3900.18-450.113.19 | Revision: 201911 | Page 1 of 6

# ZCM Series Datasheet

## PERFORMANCE DATE

| Type | | | | ZCM102 | ZCM204 | ZCM207 |
|---|---|---|---|---|---|---|
| Historical Part Number | | | | - | ZC0204 | ZC0207 |
| Climatic Category | | | | 55/155/56 | | |
| Short Time Overload<br>*IEC60115-1 clause 4.13*<br>*($U=2{,}5*\sqrt{P_{70}\times R}$, ≤2* $U_{max}$ 5 [s])* | Standard operation | ±[%] | | 0,1 (<211kΩ) ;<br>0,15(>211kΩ) | 0,03 (≤1M) ; 0,15 (>1M) | 0,03 (≤1M) ; 0,15 (>1M) |
| | Power operation | | | - | 0,05 (≤1M) ; 0,15 (>1M) | 0,05 (≤1M) ; 0,15 (>1M) |
| Single pulse high voltage overload<br>*IEC60115-1 clause 4.27*<br>*($U=10*\sqrt{P_{70}\times R}$,Severity 4, 10 pulses 10[µs]/700[µs]* | Standard operation | ±[%] | | - | 0,15 | 0,25 |
| | Power operation | | | - | 0,15 | 0,5 |
| Periodic electric overload<br>*IEC60115-1 clause 4.39*<br>*($U=15*\sqrt{P_{70}\times R}$,0.1[s]on, 2.5[s]off,1000 cycles* | Standard operation | ±[%] | | - | 0,15 | 0,15 |
| | Power operation | | | - | 0,3 | 0,3 |
| Failure Rate (Total, 90 , max, 60[%] cont. lev.) | | [$10^{-9}$ $h^{-1}$] | | ≤ 0,1 | | |
| Endurance at 70ºC,<br>*IEC60115-1 clause 4.25.1*<br>*($U=\sqrt{P_{70}\times R}$ $U_{max}$, 1,5[h]ON ; 0,5[h]OFF)* | Precision operation | ±[%] | 1000h | - | 0.05 (10R≤1M) | 0.05 (10R≤1M) |
| | | | 8000h | - | 0.1 (10R≤1M) | 0.1 (10R≤1M) |
| | Standard operation | ±[%] | 1000h | 0,25 (<211kΩ) ;0,5(>211kΩ) | 0.15 (<10R) ; 0.1 (10R≤1M) ; 0.25 | 0.15 (≤1M) ; 0.5 (>1M) |
| | | | 8000h | 0,5 (<211kΩ) ; 1 (>211kΩ) | 0.3 (<10R) ; 0.2 (10R≤1M) ; 0.5 | 0.3 (≤1M) ; 1 (>1M) |
| | Power operation | ±[%] | 1000h | - | 0.25 | 0,25 (≤1M) ; 0,5 (>1M) |
| | | | 8000h | - | 0.5 | 0,5 (≤1M) ; 1 (>1M) |
| Endurance at upper Category Temp.<br>*IEC60115-1 clause 4.25.3*<br>*( 1000[h]* | | ±[%] | 125ºC | 0,25 (<211kΩ) ; 1 (>211kΩ) | 0,15 (≤1M) ; 0,5 (>1M) | 0.15 (<10R) ; 0.1 (10R≤1M) ; 0.25 (>1M) |
| | | | 155ºC | - | 0,3 (≤1M) ; 1 (>1M) | 0.3 (<10R) ; 0.2 (10R≤1M) ; 0.5 (>1M) |
| Damp Heat, Steady State<br>*IEC60115-1 clause 4.24*<br>*($40^{\pm2}$[°C], $93^{\pm3}$[% r.h.], 56[d])* | | ±[%] | | 0,5 (<211kΩ) ; 1 (>211kΩ) | 0,25 (≤ 1M) ; 1 (>1M) | 0,25 (≤ 1M) ; 1 (>1M) |
| Damp Heat, Steady State, Accelerated<br>*IEC60115-1 clause 4.37*<br>*($85^{\pm2}$[°C], $85^{\pm5}$[%RH], U = 0.3*$\sqrt{P_{70}\times R}$)* | | ±[%] | | - | 0,25 (≤ 1M) ; 2 (>1M) | 0,5 (≤ 1M) ; 2 (>1M) |
| Temperature Cycling<br>*IEC60068-2-14 ; IEC60115-1 clause 4.19*<br>*( 30[min] each , 1000 cycles)* | | ±[%] | -55~125ºC | - | 0,25 | 0,25 |
| | | | -55~155ºC | - | 0,5 | 0,5 |
| Vibration<br>*IEC60068-2-6 ; IEC60115-1 clause 4.22*<br>*(10;2000[Hz], ≤1,5[mm] , or ≤200[$m/s^2$] 7,5[h])* | | ±[%] | | - | 0,05 (≤ 1M) ; 0,1 (>1M) | 0,05 |
| Resistance to Soldering Heat<br>*IEC60115-1 clause 4.18*<br>*($260^{\pm5}$[°C], $10^{\pm1}$[s])Solder bath method* | | ±[%] | | 0,1 (<211kΩ) ;<br>0,25(>211kΩ) | 0,1 (≤ 10R) ; 0,05 (>10R) | 0,1 (≤ 10R) ; 0,05 (>10R) |
| Electrostatic Discharge<br>*IEC60115-1 clause 4.38 ; IEC61340-3-1*<br>*( 3 positives + 3 negatives discharges)* | | ±[%] | | - | 0,5 [2 kV] | 0,5 [4 kV] |
| Voltage proof<br>*IEC60115-1 clause 4.7 $U_{RMS}=U_{INS}$, 60 [s]* | | | | - | No flash over or breakdown | |
| Flammability<br>*IEC60115-1 clause 4.35, IEC60695-11-5*<br>*Needle flame test, 10[s]* | | | | - | No burning after 30[s] | |
| Solderability<br>*IEC60068-2-20 ; IEC60115-1 clause 4.17*<br>*($235^{\pm3}$[ºC] $2^{\pm0,2}$[s],$SnAg_3Cu_{0.5}$ or $SnAg_{3.5}$)* | | | | - | ≥ 95% covered, no visible damage | |
| Component Resistance to Solvents<br>*IEC60068-2-45 ; IEC60115-1 clause 4.29*<br>*(50[ºC] method 2)* | | | | No visible damage | | |
| Resistance to solvents of Marking<br>*IEC60068-2-45 ; IEC60115-1 clause 4.30*<br>*(50[ºC] method 1)* | | | | Marking visible , no visible damage | | |
| Marking<br>*IEC60062* | | | | Color code | | |

**NOTES: MARKING [COLOR CODE]:**

- **ZCM204** Color code marking is applied according to IEC 60062 in four bands (E24 series) for 5 % tolerance, or in five bands (E96 or E192 series). Each color band appears as a single solid line, voids are permissible if at least $^2/_3$ of the band is visible from each radial angle of view. The last color band for tolerance is approximately 50 % wider than the other bands.
- **ZCM207** Color code marking is applied according to IEC 60062 in four (E24 series) or six bands (E96 series). Each color band appears as a single solid line, voids are permissible if at least $^2/_3$ of the band is visible from each radial angle of view. The last color band represents the TCR for resistors with TCR ≤50 ppm/K and nominal tolerance ≤1 %.

**Zero ohm jumpers** are marked with one centered black band.



For sales, contact : +351 214 457 700 | Fax: +351 214 457 755 | vitrohm.rfq@yageo.com | www.vitrohm.com

## TEMPERATURE COEFFICIENT

| ZCM102 | ZCM204 | ZCM207 | | | |
|---|---|---|---|---|---|
| Resistance range | | | Tolerance | TCR | E-Series |
| - | 0R22 … 0R91 | 0R16 … 0R91 | ± 5% | ± 100 ppm/K | E24 |
| - | | 0R22 … 0R91 | ± 2% | | |
| 10R…2M21 | 0R82… 10M | 1R… 10M | ± 1% | ± 50 ppm/K | E24 / E96 |
| - | 10R… 1M65 | 1R… 2M21 | ± 0,5% | | E24 / E192 |
| - | 10R… 1M65 | 43R… 1M | ± 0,5% | ± 25 ppm/K | E24 / E192 |
| - | 22R… 1M65 | 43R… 1M | ± 0,25% | | |
| 100R… 100K | 22R… 1M65 | 43R… 1M | ± 0,1% | | |
| - | 10R… 221K | 100R… 511K | ± 0,5% | ± 15 ppm/K | E24 / E192 |
| - | 22R… 221K | 100R… 511K | ± 0,25% | | |
| 100R… 100K | 43R… 221K | 100R… 511K | ± 0,1% | | |
| Jumper $I_{max}$ = 2A | Jumper $I_{max}$ = 3A | Jumper $I_{max}$ = 5A | ≤ 10 mΩ | | |

- The body coating color is light green for jumpers and for a temperature coefficient of ±50 or 100 [ppm], pink for ±25[ppm] and violet for ±15[ppm]

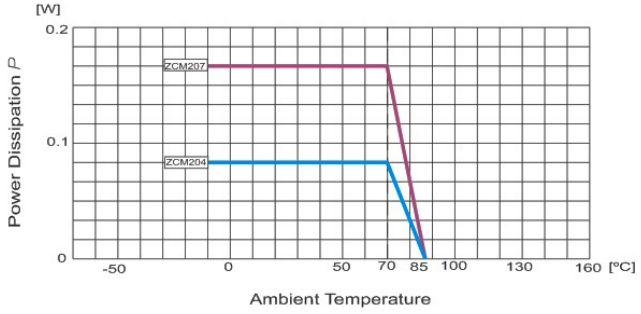
## MAXIMUM RESISTANCE CHANGE AT RATED DISSIPATION

| | | ZCM102 | ZCM204 | | | ZCM207 | | |
|---|---|---|---|---|---|---|---|---|
| OPERATION MODE | | STANDARD | PRECISION | STANDARD | POWER | PRECISION | STANDARD | POWER |
| Rated Power dissipation $P_{70}$ [W] | | 0,2 | 0,07 | 0,25 | 0,4 | 0,125 | 0,4 | 1,0 |
| Operating temp. range [ºC] | | -55 to 125 | -10 to 85 | -55 to 125 | -55 to 155 | -10 to 85 | -55 to 125 | -55 to 155 |
| Permissible film temperature ϑF Max [ºC] | | 125 | 85 | 125 | 155 | 85 | 125 | 155 |
| Resistance range | | 10R – 2M21 | 10R – 1M | R22 – 1M | R22 – 10M | 100R – 511K | 1R0 – 1M | 1R0 – 1M |
| Max. Resistance drift [%] [ΔR/R] | 1000h | ≤0,5 | ≤0,05 | ≤0,15 | ≤0,25 | ≤0,05 | ≤0,15 | ≤0,25 |
| | 8000h | ≤1 | ≤0,1 | ≤0,3 | ≤0,5 | ≤0,1 | ≤0,3 | ≤0,5 |
| | 225 000h | - | ≤0,25 | ≤0,75 | - | ≤0,25 | ≤1,0 | - |

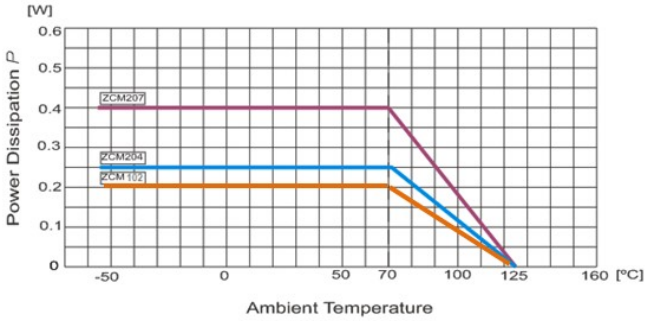
- A suitable low thermal resistance of the circuit board assembly must be safeguarded in order to maintain the film temperature of the resistors within the specified limits.

## PERFORMANCE GRAPH's

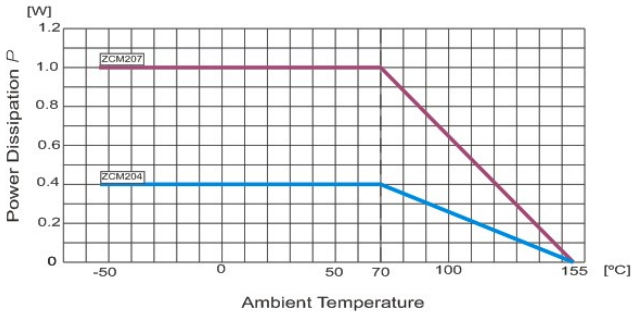
**Derating – Precision Operation**



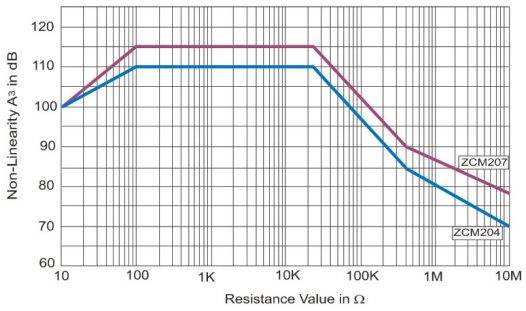

**Derating – Standard Operation**



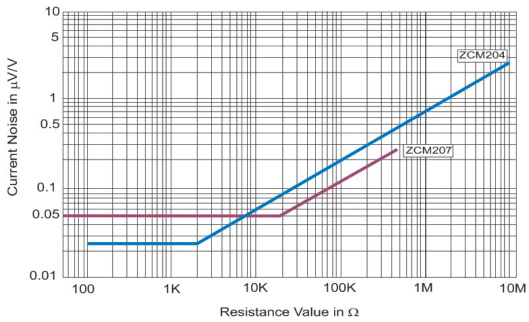

**Derating – Power Operation**



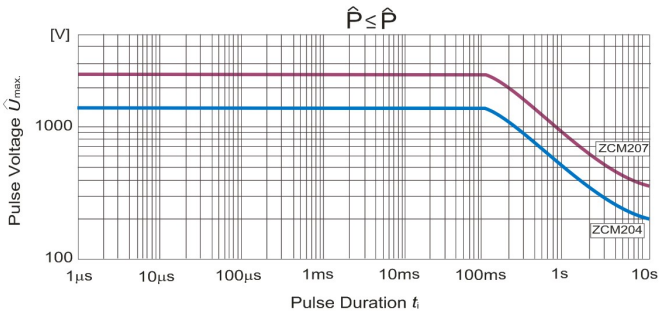

**Non- Linearity**



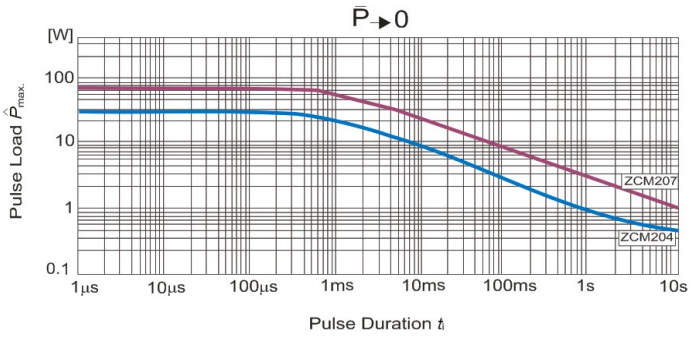

**Current Noise**



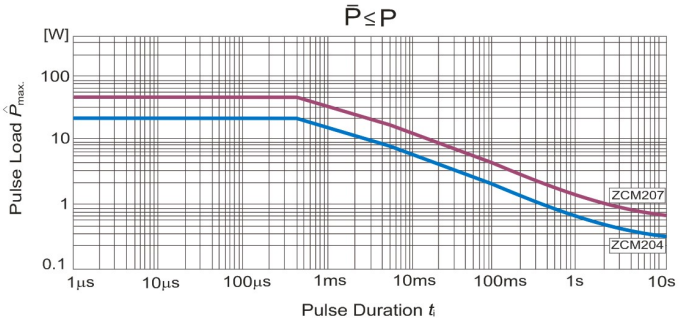

**Pulse Voltage**



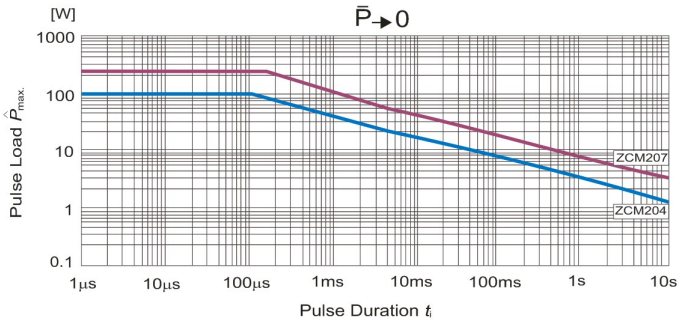
**Single Pulse for *R* < 10Ω**



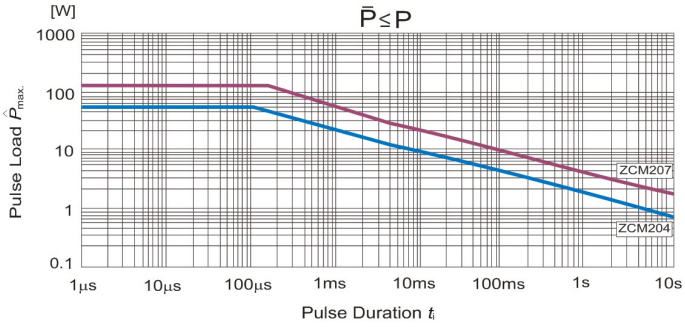

**Continuous Pulse for *R* < 10Ω**



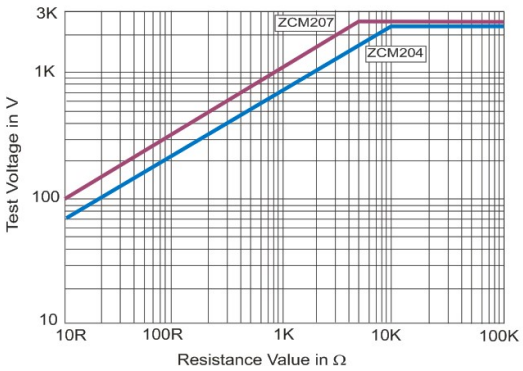

**Single Pulse for *R* ≥ 10Ω**



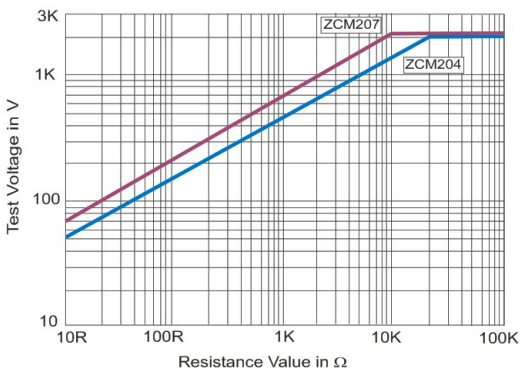

**Continuous Pulse for *R* ≥ 10Ω**




**Single Pulse (1.2/50 [µs])**

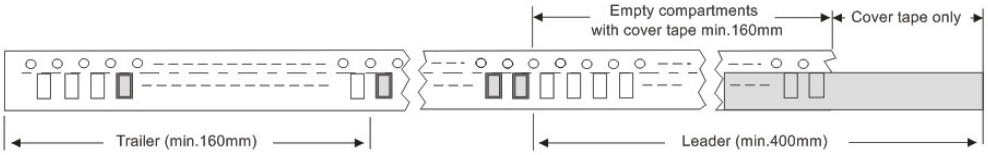


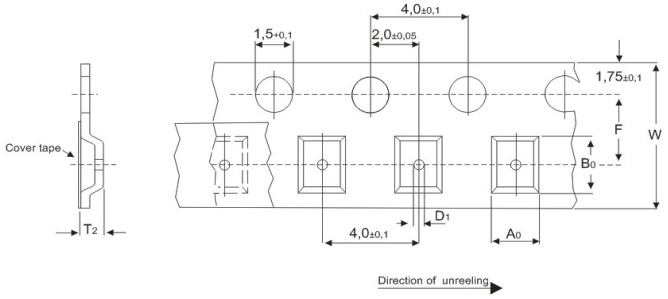

**Single Pulse (10/700 [µs])**



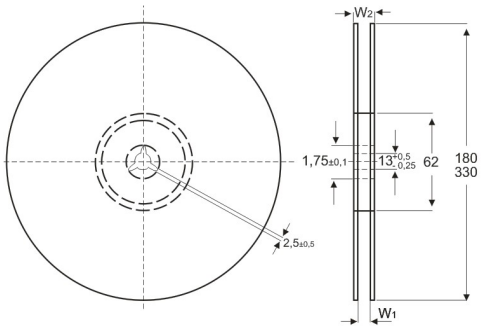
## PACKAGING - Blister tape

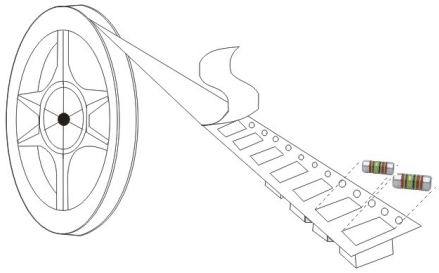
The type ZCM is packed in antistatic blister tape according to IEC60286-3, type 2a, packing details described below,




| Type | A0 | B0 | F | W | D1 | T2 |
|---|---|---|---|---|---|---|
| ZCM102 | 1,3±0,1 | 2,47±0,1 | 3,5±0,05 | 8,0.±0,3/-0,1 | 1,0 | ≤ 1,65 |
| ZCM204 | 1,55±0,1 | 3,7±0,1 | 3,5±0,05 | 8,0.±0,3 | 1,0 | ≤ 1,8 |
| ZCM207 | 2,40±0,1 | 6,0±0,1 | 5,5±0,05 | 12,0.±0,3 | 1,5 | ≤ 2,7 |



| Type | W1 [±1,5] | W2 [max] |
|---|---|---|
| ZCM102 | 8,4+1,5/-0 | 14,4 |
| ZCM204 | 8,4 | 14,4 |
| ZCM207 | 12,4 | 18,4 |

| Type | Packaging [dimensions] | Quantity [pcs] |
|---|---|---|
| ZCM102 | 07(inch) Blister tape | 3000 |
| ZCM204 | | 3000 |
| ZCM207 | | 1500 |
| ZCM204 | 13(inch) Blister tape | 10000 |
| ZCM207 | | 7500 |