

# Axial Leaded Multilayer Ceramic Capacitors for General Purpose Class 1, Class 2 and Class 3, 50 V<sub>DC</sub>, 100 V<sub>DC</sub>, 200 V<sub>DC</sub>, 500 V<sub>DC</sub>



## FEATURES

- High capacitance with small size
- High reliability
- Axial mounting style
- Material categorization:  
For definitions of compliance please see  
[www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)


**RoHS**  
COMPLIANT

## APPLICATIONS

- Temperature compensation
- Coupling and decoupling

| QUICK REFERENCE DATA       |        |      |      |      |           |         |        |        |           |         |
|----------------------------|--------|------|------|------|-----------|---------|--------|--------|-----------|---------|
| DESCRIPTION                | VALUE  |      |      |      |           |         |        |        |           |         |
| Ceramic Class              | 1      |      |      |      | 2         |         |        |        | 3         |         |
| Ceramic Dielectric         | C0G    |      |      |      | X7R       |         |        |        | Y5V       |         |
| Voltage (V <sub>DC</sub> ) | 50     | 100  | 200  | 500  | 50        | 100     | 200    | 500    | 50        | 100     |
| Min. Capacitance (pF)      | 10     | 10   | 33   | 33   | 100       | 100     | 100    | 100    | 10 000    | 10 000  |
| Max. Capacitance (pF)      | 10 000 | 5600 | 2200 | 1000 | 1 000 000 | 220 000 | 47 000 | 33 000 | 1 000 000 | 220 000 |
| Mounting                   | Axial  |      |      |      |           |         |        |        |           |         |

## MARKING

Marking indicates capacitance value and tolerance in accordance with "EIA 198" and voltage marks.

## OPERATING TEMPERATURE RANGE

C0G, X7R: - 55 °C to + 125 °C

Y5V: - 30 °C to + 85 °C

## TEMPERATURE CHARACTERISTICS

Class 1: C0G

Class 2: X7R

Class 3: Y5V

## SECTIONAL SPECIFICATIONS

Climatic category (acc. to EN 60058-1)

Class 1 and 2: 55/125/21

Class 3: 30/85/21

## APPROVALS

EIA 198

IEC 60384-9

## DESIGN

The capacitors consist of a MLCC, and connection leads are made of tinned Fecuma wire, having diameters of 0.5 mm.

Coating is made of yellow colored flame retardant epoxy resin in accordance with UL 94 V-0.

## CAPACITANCE RANGE

10 pF to 1000 nF

## TOLERANCE ON CAPACITANCE

± 5 %, ± 10 %, ± 20 %, + 80 %/- 20 %

## RATED VOLTAGE

50 V<sub>DC</sub>, 100 V<sub>DC</sub>, 200 V<sub>DC</sub>, 500 V<sub>DC</sub>

## TEST VOLTAGE

- 50 V<sub>DC</sub> and 100 V<sub>DC</sub>: 250 % of rated voltage
- 200 V<sub>DC</sub>: 150 % of rated voltage + 100 V<sub>DC</sub>
- 500 V<sub>DC</sub>: 130 % of rated voltage + 100 V<sub>DC</sub>

## INSULATION RESISTANCE AT 500 V<sub>DC</sub>

- 50 V<sub>DC</sub> and 100 V<sub>DC</sub>: 100 GΩ or 1000 ΩF whichever is less at rated voltage within 2 min of charging
- 200 V<sub>DC</sub> and 500 V<sub>DC</sub>: 10 GΩ or 100 ΩF whichever is less at rated voltage within 2 min of charging

## DISSIPATION FACTOR

Class 1 0.1 % max. when C ≥ 30 pF  
(1 MHz 1 V where C ≤ 1000 pF, and 1 kHz 1 V where C > 1000 pF)

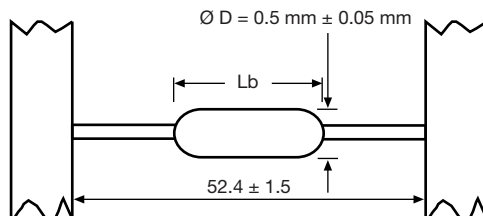
For C < 30 pF: DF = 100/(400 + 20 x C)

DF = Dissipation factor in %;

C = Capacitance value in pF

Class 2 2.5 % max. (1 kHz 1 V)

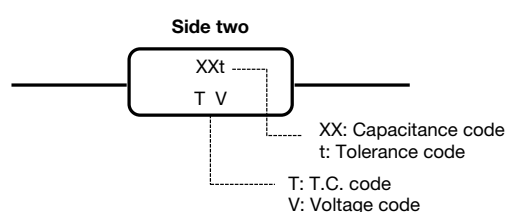
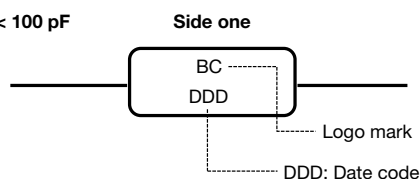
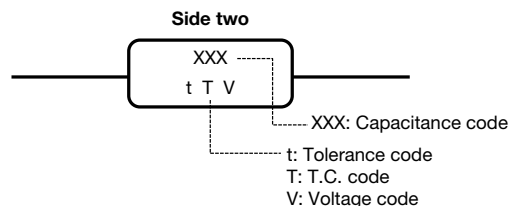
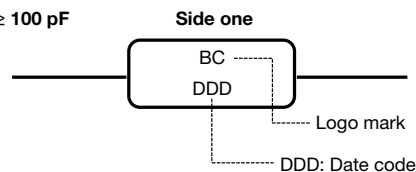
Class 3 5 % max. (1 kHz 1 V)

**DIMENSIONS** (in millimeters)


| SIZE CODE | Lb <sub>MAX.</sub> | ØD <sub>MAX.</sub> |
|-----------|--------------------|--------------------|
| 15        | 3.8                | 2.6                |
| 20        | 5.1                | 3.1                |

**Note**

- The leads are matte tinned FeCu wire.

**MARKING**
**CAPACITANCE VALUE < 100 pF**

**CAPACITANCE VALUE ≥ 100 pF**

**MARKING CODE DESCRIPTION**

| DDD                                                                                                                                                     | xxx                                                                                                                                                   | t                                                          | v                                               | T                                   |
|---------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|-------------------------------------------------|-------------------------------------|
| Date Code                                                                                                                                               | Capacitance Code                                                                                                                                      | Tolerance Code                                             | Voltage Code                                    | T.C. Code                           |
| The first digit is the year, the last two digits are the week.<br>For example:<br>109 = 2011, 9 <sup>th</sup> week<br>217 = 2012, 17 <sup>th</sup> week | Two significant digits followed by one digit for the multiplier as given below.<br>1 = x 10, 2 = x 100,<br>3 = x 1000, 4 = x 10 000,<br>5 = x 100 000 | J = ± 5 %<br>K = ± 10 %<br>M = ± 20 %<br>Z = + 80 %/- 20 % | 1 = 100 V<br>2 = 200 V<br>4 = 500 V<br>5 = 50 V | A = C0G (NP0)<br>C = X7R<br>Y = Y5V |

**Note**

- The capacitance code indicates actual capacitance in pF when capacitance value < 100 pF.

**ORDERING CODE INFORMATION**

| A                     | 104                                                                                                                                                                  | K                                                          | 15                                 | X7R                                | F                                                                                                                                 | 5                     | TAA                      |
|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|------------------------------------|------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|-----------------------|--------------------------|
| 1                     | 2 3 4                                                                                                                                                                | 5                                                          | 6 7                                | 8 9 10                             | 11                                                                                                                                | 12                    | 13 14 15                 |
| Product Type          | Capacitance (pF)                                                                                                                                                     | Capacitance Tolerance                                      | Size Code                          | TC Code                            | Rated Voltage                                                                                                                     | Lead Diameter         | Packaging                |
| A = Axial leaded MLCC | The first two digits are the significant figures of capacitance and the last digit is a multiplier as follows:<br>1 = *10<br>2 = * 100<br>3 = * 1000<br>4 = * 10 000 | J = ± 5 %<br>K = ± 10 %<br>M = ± 20 %<br>Z = + 80 %/- 20 % | Please refer to relevant datasheet | Please refer to relevant datasheet | E = 25 V <sub>DC</sub><br>F = 50 V <sub>DC</sub><br>H = 100 V <sub>DC</sub><br>K = 200 V <sub>DC</sub><br>L = 500 V <sub>DC</sub> | 5 = 0.50 mm ± 0.05 mm | TAA = Reel<br>UAA = Ammo |



## ORDERING CODES

| DIELECTRIC C0G |                    |                     |                     |                     |
|----------------|--------------------|---------------------|---------------------|---------------------|
| CAP.<br>(pF)   | 50 V <sub>DC</sub> | 100 V <sub>DC</sub> | 200 V <sub>DC</sub> | 500 V <sub>DC</sub> |
| 10             | A100#15C0GF5###    | A100#15C0GH5###     | -                   | -                   |
| 12             | A120#15C0GF5###    | A120#15C0GH5###     | -                   | -                   |
| 15             | A150#15C0GF5###    | A150#15C0GH5###     | -                   | -                   |
| 18             | A180#15C0GF5###    | A180#15C0GH5###     | -                   | -                   |
| 22             | A220#15C0GF5###    | A220#15C0GH5###     | -                   | -                   |
| 27             | A270#15C0GF5###    | A270#15C0GH5###     | -                   | -                   |
| 33             | A330#15C0GF5###    | A330#15C0GH5###     | A330#15C0GK5###     | A330#15C0GL5###     |
| 39             | A390#15C0GF5###    | A390#15C0GH5###     | A390#15C0GK5###     | A390#15C0GL5###     |
| 47             | A470#15C0GF5###    | A470#15C0GH5###     | A470#15C0GK5###     | A470#15C0GL5###     |
| 56             | A560#15C0GF5###    | A560#15C0GH5###     | A560#15C0GK5###     | A560#15C0GL5###     |
| 68             | A680#15C0GF5###    | A680#15C0GH5###     | A680#15C0GK5###     | A680#15C0GL5###     |
| 82             | A820#15C0GF5###    | A820#15C0GH5###     | A820#15C0GK5###     | A820#15C0GL5###     |
| 100            | A101#15C0GF5###    | A101#15C0GH5###     | A101#15C0GK5###     | A101#15C0GL5###     |
| 120            | A121#15C0GF5###    | A121#15C0GH5###     | A121#15C0GK5###     | A121#15C0GL5###     |
| 150            | A151#15C0GF5###    | A151#15C0GH5###     | A151#15C0GK5###     | A151#15C0GL5###     |
| 180            | A181#15C0GF5###    | A181#15C0GH5###     | A181#15C0GK5###     | A181#15C0GL5###     |
| 220            | A221#15C0GF5###    | A221#15C0GH5###     | A221#15C0GK5###     | A221#15C0GL5###     |
| 270            | A271#15C0GF5###    | A271#15C0GH5###     | A271#15C0GK5###     | A271#15C0GL5###     |
| 330            | A331#15C0GF5###    | A331#15C0GH5###     | A331#15C0GK5###     | A331#15C0GL5###     |
| 390            | A391#15C0GF5###    | A391#15C0GH5###     | A391#15C0GK5###     | A391#15C0GL5###     |
| 470            | A471#15C0GF5###    | A471#15C0GH5###     | A471#15C0GK5###     | A471#20C0GL5###     |
| 560            | A561#15C0GF5###    | A561#15C0GH5###     | A561#15C0GK5###     | A561#20C0GL5###     |
| 680            | A681#15C0GF5###    | A681#15C0GH5###     | A681#15C0GK5###     | A681#20C0GL5###     |
| 820            | A821#15C0GF5###    | A821#15C0GH5###     | A821#15C0GK5###     | A821#20C0GL5###     |
| 1000           | A102#15C0GF5###    | A102#20C0GH5###     | A102#20C0GK5###     | A102#20C0GL5###     |
| 1200           | A122#15C0GF5###    | A122#20C0GH5###     | A122#20C0GK5###     | -                   |
| 1500           | A152#15C0GF5###    | A152#20C0GH5###     | A152#20C0GK5###     | -                   |
| 1800           | A182#15C0GF5###    | A182#20C0GH5###     | A182#20C0GK5###     | -                   |
| 2200           | A222#15C0GF5###    | A222#20C0GH5###     | A222#20C0GK5###     | -                   |
| 2700           | A272#20C0GF5###    | A272#20C0GH5###     | -                   | -                   |
| 3300           | A332#20C0GF5###    | A332#20C0GH5###     | -                   | -                   |
| 3900           | A392#20C0GF5###    | A392#20C0GH5###     | -                   | -                   |
| 4700           | A472#20C0GF5###    | A472#20C0GH5###     | -                   | -                   |
| 5600           | A562#20C0GF5###    | A562#20C0GH5###     | -                   | -                   |
| 6800           | A682#20C0GF5###    | -                   | -                   | -                   |
| 8200           | A822#20C0GF5###    | -                   | -                   | -                   |
| 10 000         | A103#20C0GF5###    | -                   | -                   | -                   |

## Notes

- Lead diameter is 0.5 mm
- # 5<sup>th</sup> digit is capacitance tolerance code:  $\pm 5\%$  = J;  $\pm 10\%$  = K
- # 13<sup>th</sup>, 14<sup>th</sup> and 15<sup>th</sup> digits are packaging code: Reel = TAA; Ammo = UAA



| DIELECTRIC X7R |                    |                     |                     |                     |
|----------------|--------------------|---------------------|---------------------|---------------------|
| CAP.<br>(pF)   | 50 V <sub>DC</sub> | 100 V <sub>DC</sub> | 200 V <sub>DC</sub> | 500 V <sub>DC</sub> |
| 100            | A101#15X7RF5###    | A101#15X7RH5###     | A101#15X7RK5###     | A101#15X7RL5###     |
| 120            | A121#15X7RF5###    | A121#15X7RH5###     | A121#15X7RK5###     | A121#15X7RL5###     |
| 150            | A151#15X7RF5###    | A151#15X7RH5###     | A151#15X7RK5###     | A151#15X7RL5###     |
| 180            | A181#15X7RF5###    | A181#15X7RH5###     | A181#15X7RK5###     | A181#15X7RL5###     |
| 220            | A221#15X7RF5###    | A221#15X7RH5###     | A221#15X7RK5###     | A221#15X7RL5###     |
| 270            | A271#15X7RF5###    | A271#15X7RH5###     | A271#15X7RK5###     | A271#15X7RL5###     |
| 330            | A331#15X7RF5###    | A331#15X7RH5###     | A331#15X7RK5###     | A331#15X7RL5###     |
| 390            | A391#15X7RF5###    | A391#15X7RH5###     | A391#15X7RK5###     | A391#15X7RL5###     |
| 470            | A471#15X7RF5###    | A471#15X7RH5###     | A471#15X7RK5###     | A471#15X7RL5###     |
| 560            | A561#15X7RF5###    | A561#15X7RH5###     | A561#15X7RK5###     | A561#15X7RL5###     |
| 680            | A681#15X7RF5###    | A681#15X7RH5###     | A681#15X7RK5###     | A681#15X7RL5###     |
| 820            | A821#15X7RF5###    | A821#15X7RH5###     | A821#15X7RK5###     | A821#15X7RL5###     |
| 1000           | A102#15X7RF5###    | A102#15X7RH5###     | A102#15X7RK5###     | A102#15X7RL5###     |
| 1200           | A122#15X7RF5###    | A122#15X7RH5###     | A122#15X7RK5###     | A122#15X7RL5###     |
| 1500           | A152#15X7RF5###    | A152#15X7RH5###     | A152#15X7RK5###     | A152#15X7RL5###     |
| 1800           | A182#15X7RF5###    | A182#15X7RH5###     | A182#15X7RK5###     | A182#15X7RL5###     |
| 2200           | A222#15X7RF5###    | A222#15X7RH5###     | A222#15X7RK5###     | A222#15X7RL5###     |
| 2700           | A272#15X7RF5###    | A272#15X7RH5###     | A272#15X7RK5###     | A272#15X7RL5###     |
| 3300           | A332#15X7RF5###    | A332#15X7RH5###     | A332#15X7RK5###     | A332#20X7RL5###     |
| 3900           | A392#15X7RF5###    | A392#15X7RH5###     | A392#15X7RK5###     | A392#20X7RL5###     |
| 4700           | A472#15X7RF5###    | A472#15X7RH5###     | A472#15X7RK5###     | A472#20X7RL5###     |
| 5600           | A562#15X7RF5###    | A562#15X7RH5###     | A562#15X7RK5###     | A562#20X7RL5###     |
| 6800           | A682#15X7RF5###    | A682#15X7RH5###     | A682#15X7RK5###     | A682#20X7RL5###     |
| 8200           | A822#15X7RF5###    | A822#15X7RH5###     | A822#15X7RK5###     | A822#20X7RL5###     |
| 10 000         | A103#15X7RF5###    | A103#15X7RH5###     | A103#15X7RK5###     | A103#20X7RL5###     |
| 12 000         | A123#15X7RF5###    | A123#15X7RH5###     | A123#15X7RK5###     | A123#20X7RL5###     |
| 15 000         | A153#15X7RF5###    | A153#15X7RH5###     | A153#15X7RK5###     | A153#20X7RL5###     |
| 18 000         | A183#15X7RF5###    | A183#15X7RH5###     | A183#15X7RK5###     | A183#20X7RL5###     |
| 22 000         | A223#15X7RF5###    | A223#15X7RH5###     | A223#15X7RK5###     | A223#20X7RL5###     |
| 27 000         | A273#15X7RF5###    | A273#20X7RH5###     | A273#20X7RK5###     | A273#20X7RL5###     |
| 33 000         | A333#15X7RF5###    | A333#20X7RH5###     | A333#20X7RK5###     | A333#20X7RL5###     |
| 39 000         | A393#15X7RF5###    | A393#20X7RH5###     | A393#20X7RK5###     | -                   |
| 47 000         | A473#15X7RF5###    | A473#20X7RH5###     | A473#20X7RK5###     | -                   |
| 56 000         | A563#15X7RF5###    | A563#20X7RH5###     | -                   | -                   |
| 68 000         | A683#15X7RF5###    | A683#20X7RH5###     | -                   | -                   |
| 82 000         | A823#15X7RF5###    | A823#20X7RH5###     | -                   | -                   |
| 100 000        | A104#15X7RF5###    | A104#20X7RH5###     | -                   | -                   |
| 150 000        | A154#20X7RF5###    | A154#20X7RH5###     | -                   | -                   |
| 220 000        | A224#20X7RF5###    | A224#20X7RH5###     | -                   | -                   |
| 330 000        | A334#20X7RF5###    | -                   | -                   | -                   |
| 470 000        | A474#20X7RF5###    | -                   | -                   | -                   |
| 560 000        | A564#20X7RF5###    | -                   | -                   | -                   |
| 680 000        | A684#20X7RF5###    | -                   | -                   | -                   |
| 1 000 000      | A105#20X7RF5###    | -                   | -                   | -                   |

**Notes**

- Lead diameter is 0.5 mm
- # 5<sup>th</sup> digit is capacitance tolerance code:  $\pm 10\%$  = K;  $\pm 20\%$  = M
- # 13<sup>th</sup>, 14<sup>th</sup> and 15<sup>th</sup> digits are packaging code: Reel = TAA; Ammo = UAA

| <b>DIELECTRIC Y5V</b> |                          |                           |
|-----------------------|--------------------------|---------------------------|
| <b>CAP.<br/>(pF)</b>  | <b>50 V<sub>DC</sub></b> | <b>100 V<sub>DC</sub></b> |
| 10 000                | A103Z15Y5VF5###          | A103Z15Y5VH5###           |
| 15 000                | A153Z15Y5VF5###          | A153Z15Y5VH5###           |
| 22 000                | A223Z15Y5VF5###          | A223Z15Y5VH5###           |
| 33 000                | A333Z15Y5VF5###          | A333Z15Y5VH5###           |
| 47 000                | A473Z15Y5VF5###          | A473Z15Y5VH5###           |
| 68 000                | A683Z15Y5VF5###          | A683Z15Y5VH5###           |
| 100 000               | A104Z15Y5VF5###          | A104Z15Y5VH5###           |
| 150 000               | A154Z15Y5VF5###          | A154Z20Y5VH5###           |
| 220 000               | A224Z15Y5VF5###          | A224Z20Y5VH5###           |
| 330 000               | A334Z20Y5VF5###          | -                         |
| 470 000               | A474Z20Y5VF5###          | -                         |
| 680 000               | A684Z20Y5VF5###          | -                         |
| 1 000 000             | A105Z20Y5VF5###          | -                         |

**Notes**

- Lead diameter is 0.5 mm
- Tolerance is + 80 %/- 20 %
- # 13<sup>th</sup>, 14<sup>th</sup> and 15<sup>th</sup> digits are packaging code: Reel = TAA; Ammo = UAA

**TAPING AND PACKAGING**
**LABELLING**

Each reel is provided with a label showing the following details:

Manufacturer, A style, capacitance, tolerance, batch number, quantity of components, rated voltage, dielectric.

On special request other designations can be shown.

For example:




PN: A332K15X7RF5UAA  
QTY: 4000  
PO:  
SO:

Lot1: 11W601503  
Lot2:  
Batch: 200602CN  
Region: 9520  
Ser.No: 0602A03681

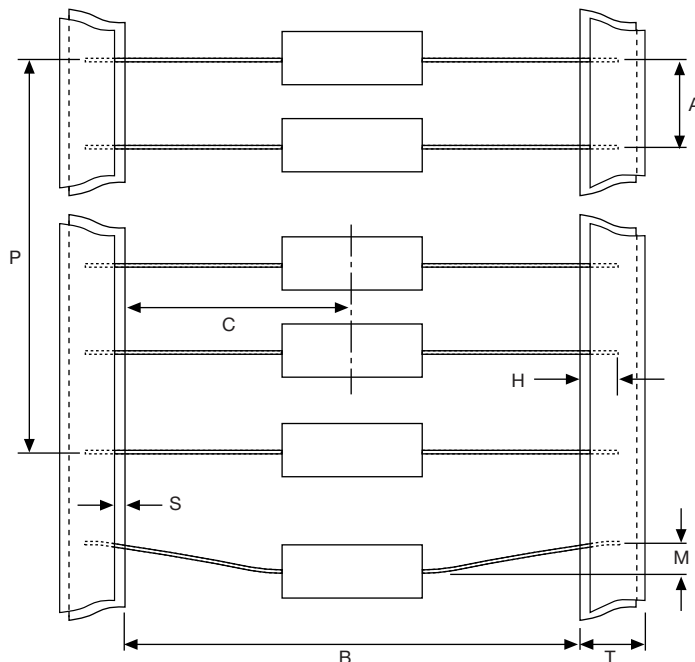
DC1: 0602  
DC2:  
SL: 0010




RoHS

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| <b>PACKAGING QUANTITIES AND BOX DIMENSIONS</b> |                  |                                          |                                      |
|------------------------------------------------|------------------|------------------------------------------|--------------------------------------|
| <b>PACKAGING</b>                               | <b>SIZE CODE</b> | <b>SMALLEST PACKAGING QUANTITY (SPQ)</b> | <b>BOX DIMENSIONS L x W x H (mm)</b> |
| Tape on reel                                   | 15, 20           | 7000                                     | 370 x 370 x 90                       |
| Ammopack                                       | 15, 20           | 4000                                     | 265 x 85 x 95                        |

**CAPACITORS ON BANDOLIER FOR DIPPED AXIAL**


| PARAMETER                                  | SYMBOL           | DIMENSIONS |               |
|--------------------------------------------|------------------|------------|---------------|
|                                            |                  | mm         | INCH          |
| Inside tape spacing                        | B <sup>(1)</sup> | 52.4 ± 1.5 | 2.062 ± 0.059 |
| Center to tape spacing                     | C                | ± 0.8      | ± 0.031       |
| Cumulative pitch, 6 consecutive components | P                | ± 1.5      | ± 0.059       |
| Components pitch                           | A                | 5 ± 0.5    | 0.197 ± 0.015 |
| Lead bend                                  | M                | < 1.2      | < 0.047       |
| Exposed adhesive                           | S                | < 0.51     | > 0.020       |
| Tape width                                 | T                | 6.35       | 0.250         |
| Lead sandwich                              | H                | > 3.96     | > 0.156       |

**Note**

(1) Inside tape spacing 26.0 mm + 1.51 mm/- 0.0 mm is available on request

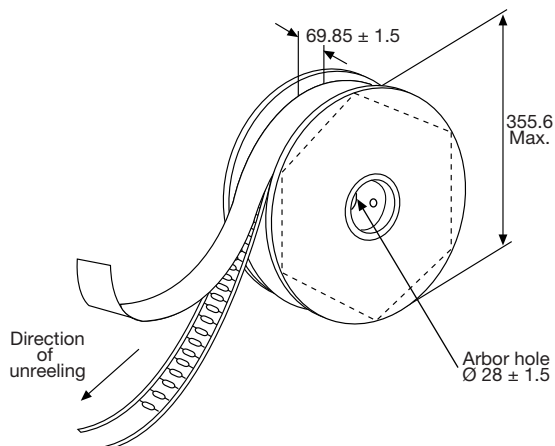
**REEL DATA**

A maximum of 0.5 % of the total number of capacitors per reel may be missing.

A maximum of 1 consecutive vacant positions is followed by 6 consecutive components.

Tape begins and ends with a minimum of 4 empty positions (180 mm tape).

Maximum of 5 splicers per reel.

**REEL**


### AMMOPACK DATA

A maximum of 0.5 % of the total number of capacitors per reel may be missing.

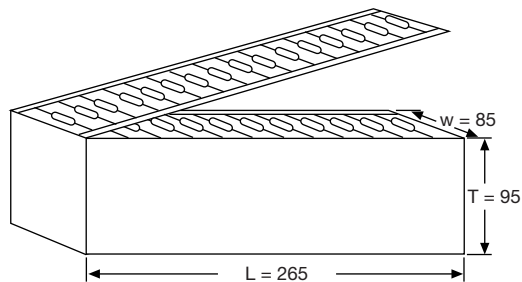
A maximum of 1 consecutive vacant positions is followed by 6 consecutive components.

Tape begins and ends with a minimum of 4 empty positions (180 mm tape).

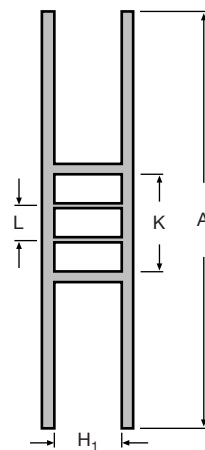
Maximum of 5 splicers per reel.

The cumulative pitch tolerance over 20 consecutive units is not to exceed  $\pm 1.0$  mm.

### AMMOPACK



### REEL DIMENSIONS



| REEL SIZE      |                | (mm)           |
|----------------|----------------|----------------|
| A              | Outer diameter | 355.6 max.     |
| L              | Hole diameter  | $28 \pm 1.5$   |
| K              | Core diameter  | 90             |
| H <sub>1</sub> | Internal width | $69.9 \pm 1.5$ |



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