

Radial Leaded Multilayer Ceramic Capacitors for General Purpose Class 1 and Class 2, 50 V_{DC}, 100 V_{DC}, 200 V_{DC}, 500 V_{DC}


FEATURES

- High capacitance with small size
- High reliability
- Crimp and straight leadstyles
- Material categorization:
for definitions of compliance please see www.vishay.com/doc?99912


RoHS
COMPLIANT

APPLICATIONS

- Temperature compensation
- Coupling and decoupling

| QUICK REFERENCE DATA | | | | | | | | |
|----------------------------|--------|------|------|------|-----------|---------|---------|--------|
| DESCRIPTION | VALUE | | | | | | | |
| Ceramic Class | 1 | | | | 2 | | | |
| Ceramic Dielectric | C0G | | | | X7R | | | |
| Voltage (V _{DC}) | 50 | 100 | 200 | 500 | 50 | 100 | 200 | 500 |
| Min. Capacitance (pF) | 10 | 10 | 33 | 33 | 100 | 100 | 100 | 100 |
| Max. Capacitance (pF) | 10 000 | 5600 | 3900 | 1800 | 1 000 000 | 560 000 | 220 000 | 47 000 |
| Mounting | Radial | | | | | | | |

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

TEMPERATURE CHARACTERISTICS

Class 1: C0G

Class 2: X7R

SECTIONAL SPECIFICATIONS

Climatic category (acc. to EN 60058-1)

Class 1 and 2: 55/125/21

APPROVALS

EIA 198

IEC 60384-9

DESIGN

- The capacitors consist of a general purpose MLCC
- The lead wires are 0.5 mm and are made of 100 % tinned copper clad steel wire
- The capacitors may be supplied with straight or kinked leads having a lead spacing of 2.5 mm and 5.0 mm
- Coating is made of yellow colored flame retardant epoxy resin in accordance with UL 94 V-0

CAPACITANCE RANGE

10 pF to 1 μF

TOLERANCE ON CAPACITANCE

± 5 %, ± 10 %, ± 20 %

RATED VOLTAGE

50 V_{DC}, 100 V_{DC}, 200 V_{DC}, 500 V_{DC}

TEST VOLTAGE

- 50 V_{DC} and 100 V_{DC}: 250 % of rated voltage
- 200 V_{DC}: 150 % of rated voltage + 100 V_{DC}
- 500 V_{DC}: 130 % of rated voltage + 100 V_{DC}

INSULATION RESISTANCE AT RATED VOLTAGE

- 50 V_{DC} and 100 V_{DC}: 100 GΩ or 1000 ΩF, whichever is less at rated voltage within 2 min of charging
- 200 V_{DC}, 500 V_{DC}, and size 10: 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
(at 1 MHz; 1 V where C ≤ 1000 pF, and at 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. (at 1 kHz; 1 V)

LEAD CONFIGURATION AND DIMENSIONS (in millimeters)

| SIZE CODE | Wb _{MAX.} | H _{MAX.} | T _{MAX.} | MAXIMUM SEATING HEIGHT (SH) | | | |
|-----------|--------------------|-------------------|-------------------|-----------------------------|-----|-----|-----|
| | | | | L2 | H5 | K2 | K5 |
| 10 | 3.6 | 3.6 | 2.3 | 1.6 | 2.6 | 3.5 | - |
| 15 | 4.0 | 4.0 | 2.6 | 1.6 | 2.6 | 3.5 | 3.5 |
| 20 | 5.0 | 5.0 | 3.2 | 1.6 | 2.6 | 3.5 | 3.5 |

Notes

- Bulk packed types have a standard lead length L = 30 mm ± 5 mm
- The K5 lead style is not available for size 10
- L2 and H5 are preferred styles

MARKING

| SIZE 10 AND 15 CAPACITANCE VALUE < 100 pF | SIZE 10 AND 15 CAPACITANCE VALUE ≥ 100 pF | SIZE 20 |
|--|--|---|
| <p>Vishay logo or BC logo</p> <p>t: Tolerance code</p> <p>XX: Capacitance code</p> | <p>Vishay logo or BC logo</p> <p>XXX: Capacitance code</p> | <p>Vishay logo or BC logo</p> <p>t: Tolerance code</p> <p>XXX: Capacitance code</p> |

Notes

- The capacitance code indicates actual capacitance in pF when capacitance value < 100 pF
- Two significant digits followed by one digit for the multiplier as given following: 1 = * 10, 2 = * 100, 3 = * 1000, 4 = * 10 000, 5 = * 100 000
- The tolerance codes are J = 5 %, K = 10 %, M = 20 %

ORDERING CODE INFORMATION

| Product Type | Capacitance (pF) | Capacitance Tolerance | Size Code | T.C. Code | Rated Voltage | Lead Diameter | Packaging / Lead Length | Lead Style | Lead Spacing |
|------------------------|---|---------------------------------------|------------------------------------|------------------------------------|---|-----------------------|---|---|--------------------------|
| K = radial leaded MLCC | The first two digits are the significant figures of capacitance and the last digit is a multiplier as follows: 0 = * 1 1 = * 10 2 = * 100 3 = * 1000 4 = * 10 000 5 = * 100 000 | J = ± 5 % K = ± 10 % M = ± 20 % | Please refer to relevant datasheet | Please refer to relevant datasheet | F = 50 V _{DC} H = 100 V _{DC} K = 200 V _{DC} L = 500 V _{DC} | 5 = 0.50 mm ± 0.05 mm | 3 = bulk T = tape and reel U = ammo | H = flat crimp L = straight K = outside crimp | 2 = 2.5 mm 5 = 5.0 mm |



ORDERING CODES

| DIELECTRIC COG | | | | | | |
|----------------|--------------------|-----------------|---------------------|-----------------|---------------------|---------------------|
| CAP. (pF) | 50 V _{DC} | | 100 V _{DC} | | 200 V _{DC} | 500 V _{DC} |
| | SMALLER SIZE | NORMAL SIZE | SMALLER SIZE | NORMAL SIZE | NORMAL SIZE | NORMAL SIZE |
| 10 | K100#10C0GF5### | K100#15C0GF5### | K100#10C0GH5### | K100#15C0GH5### | - | - |
| 12 | K120#10C0GF5### | K120#15C0GF5### | K120#10C0GH5### | K120#15C0GH5### | - | - |
| 15 | K150#10C0GF5### | K150#15C0GF5### | K150#10C0GH5### | K150#15C0GH5### | - | - |
| 18 | K180#10C0GF5### | K180#15C0GF5### | K180#10C0GH5### | K180#15C0GH5### | - | - |
| 22 | K220#10C0GF5### | K220#15C0GF5### | K220#10C0GH5### | K220#15C0GH5### | - | - |
| 27 | K270#10C0GF5### | K270#15C0GF5### | K270#10C0GH5### | K270#15C0GH5### | - | - |
| 33 | K330#10C0GF5### | K330#15C0GF5### | K330#10C0GH5### | K330#15C0GH5### | K330#15C0GK5### | K330#15C0GL5##5 |
| 39 | K390#10C0GF5### | K390#15C0GF5### | K390#10C0GH5### | K390#15C0GH5### | K390#15C0GK5### | K390#15C0GL5##5 |
| 47 | K470#10C0GF5### | K470#15C0GF5### | K470#10C0GH5### | K470#15C0GH5### | K470#15C0GK5### | K470#15C0GL5##5 |
| 56 | K560#10C0GF5### | K560#15C0GF5### | K560#10C0GH5### | K560#15C0GH5### | K560#15C0GK5### | K560#15C0GL5##5 |
| 68 | K680#10C0GF5### | K680#15C0GF5### | K680#10C0GH5### | K680#15C0GH5### | K680#15C0GK5### | K680#15C0GL5##5 |
| 82 | K820#10C0GF5### | K820#15C0GF5### | K820#10C0GH5### | K820#15C0GH5### | K820#15C0GK5### | K820#15C0GL5##5 |
| 100 | K101#10C0GF5### | K101#15C0GF5### | K101#10C0GH5### | K101#15C0GH5### | K101#15C0GK5### | K101#15C0GL5##5 |
| 120 | K121#10C0GF5### | K121#15C0GF5### | K121#10C0GH5### | K121#15C0GH5### | K121#15C0GK5### | K121#15C0GL5##5 |
| 150 | K151#10C0GF5### | K151#15C0GF5### | K151#10C0GH5### | K151#15C0GH5### | K151#15C0GK5### | K151#15C0GL5##5 |
| 180 | K181#10C0GF5### | K181#15C0GF5### | K181#10C0GH5### | K181#15C0GH5### | K181#15C0GK5### | K181#15C0GL5##5 |
| 220 | K221#10C0GF5### | K221#15C0GF5### | K221#10C0GH5### | K221#15C0GH5### | K221#15C0GK5### | K221#15C0GL5##5 |
| 270 | K271#10C0GF5### | K271#15C0GF5### | K271#10C0GH5### | K271#15C0GH5### | K271#15C0GK5### | K271#15C0GL5##5 |
| 330 | K331#10C0GF5### | K331#15C0GF5### | K331#10C0GH5### | K331#15C0GH5### | K331#15C0GK5### | K331#15C0GL5##5 |
| 390 | K391#10C0GF5### | K391#15C0GF5### | K391#10C0GH5### | K391#15C0GH5### | K391#15C0GK5### | K391#15C0GL5##5 |
| 470 | K471#10C0GF5### | K471#15C0GF5### | K471#10C0GH5### | K471#15C0GH5### | K471#15C0GK5### | K471#20C0GL5##5 |
| 560 | K561#10C0GF5### | K561#15C0GF5### | K561#10C0GH5### | K561#15C0GH5### | K561#15C0GK5### | K561#20C0GL5##5 |
| 680 | K681#10C0GF5### | K681#15C0GF5### | - | K681#15C0GH5### | K681#15C0GK5### | K681#20C0GL5##5 |
| 820 | K821#10C0GF5### | K821#15C0GF5### | - | K821#15C0GH5### | K821#15C0GK5### | K821#20C0GL5##5 |
| 1000 | K102#10C0GF5### | K102#15C0GF5### | - | K102#20C0GH5### | K102#20C0GK5### | K102#20C0GL5##5 |
| 1200 | - | K122#15C0GF5### | - | K122#20C0GH5### | K122#20C0GK5### | K122#20C0GL5##5 |
| 1500 | - | K152#15C0GF5### | - | K152#20C0GH5### | K152#20C0GK5### | K152#20C0GL5##5 |
| 1800 | - | K182#15C0GF5### | - | K182#20C0GH5### | K182#20C0GK5### | K182#20C0GL5##5 |
| 2200 | - | K222#15C0GF5### | - | K222#20C0GH5### | K222#20C0GK5### | - |
| 2700 | - | K272#20C0GF5### | - | K272#20C0GH5### | K272#20C0GK5### | - |
| 3300 | - | K332#20C0GF5### | - | K332#20C0GH5### | K332#20C0GK5### | - |
| 3900 | - | K392#20C0GF5### | - | K392#20C0GH5### | K392#20C0GK5### | - |
| 4700 | - | K472#20C0GF5### | - | K472#20C0GH5### | - | - |
| 5600 | - | K562#20C0GF5### | - | K562#20C0GH5### | - | - |
| 6800 | - | K682#20C0GF5### | - | - | - | - |
| 8200 | - | K822#20C0GF5### | - | - | - | - |
| 10 000 | - | K103#20C0GF5### | - | - | - | - |

Notes

- Lead diameter is 0.5 mm
- # 5th digit is capacitance tolerance code: ± 5 % = J; ± 10 % = K
- # 13th digit is packaging code: bulk = 3; reel = T; ammo = U
- # 14th digit is lead style code: L; H; K (L and H are preferred lead configuration)
- # 15th digit is lead spacing code: 2.5 mm = 2; 5.0 mm = 5



| DIELECTRIC X7R | | | | | | |
|----------------|--------------------|-----------------|---------------------|-----------------|---------------------|---------------------|
| CAP. (pF) | 50 V _{DC} | | 100 V _{DC} | | 200 V _{DC} | 500 V _{DC} |
| | SMALLER SIZE | NORMAL SIZE | SMALLER SIZE | NORMAL SIZE | NORMAL SIZE | NORMAL SIZE |
| 100 | K101#10X7RF5### | K101#15X7RF5### | K101#10X7RH5### | K101#15X7RH5### | K101#15X7RK5### | K101#15X7RL5##5 |
| 120 | K121#10X7RF5### | K121#15X7RF5### | K121#10X7RH5### | K121#15X7RH5### | K121#15X7RK5### | K121#15X7RL5##5 |
| 150 | K151#10X7RF5### | K151#15X7RF5### | K151#10X7RH5### | K151#15X7RH5### | K151#15X7RK5### | K151#15X7RL5##5 |
| 180 | K181#10X7RF5### | K181#15X7RF5### | K181#10X7RH5### | K181#15X7RH5### | K181#15X7RK5### | K181#15X7RL5##5 |
| 220 | K221#10X7RF5### | K221#15X7RF5### | K221#10X7RH5### | K221#15X7RH5### | K221#15X7RK5### | K221#15X7RL5##5 |
| 270 | K271#10X7RF5### | K271#15X7RF5### | K271#10X7RH5### | K271#15X7RH5### | K271#15X7RK5### | K271#15X7RL5##5 |
| 330 | K331#10X7RF5### | K331#15X7RF5### | K331#10X7RH5### | K331#15X7RH5### | K331#15X7RK5### | K331#15X7RL5##5 |
| 390 | K391#10X7RF5### | K391#15X7RF5### | K391#10X7RH5### | K391#15X7RH5### | K391#15X7RK5### | K391#15X7RL5##5 |
| 470 | K471#10X7RF5### | K471#15X7RF5### | K471#10X7RH5### | K471#15X7RH5### | K471#15X7RK5### | K471#15X7RL5##5 |
| 560 | K561#10X7RF5### | K561#15X7RF5### | K561#10X7RH5### | K561#15X7RH5### | K561#15X7RK5### | K561#15X7RL5##5 |
| 680 | K681#10X7RF5### | K681#15X7RF5### | K681#10X7RH5### | K681#15X7RH5### | K681#15X7RK5### | K681#15X7RL5##5 |
| 820 | K821#10X7RF5### | K821#15X7RF5### | K821#10X7RH5### | K821#15X7RH5### | K821#15X7RK5### | K821#15X7RL5##5 |
| 1000 | K102#10X7RF5### | K102#15X7RF5### | K102#10X7RH5### | K102#15X7RH5### | K102#15X7RK5### | K102#15X7RL5##5 |
| 1200 | K122#10X7RF5### | K122#15X7RF5### | K122#10X7RH5### | K122#15X7RH5### | K122#15X7RK5### | K122#15X7RL5##5 |
| 1500 | K152#10X7RF5### | K152#15X7RF5### | K152#10X7RH5### | K152#15X7RH5### | K152#15X7RK5### | K152#15X7RL5##5 |
| 1800 | K182#10X7RF5### | K182#15X7RF5### | K182#10X7RH5### | K182#15X7RH5### | K182#15X7RK5### | K182#15X7RL5##5 |
| 2200 | K222#10X7RF5### | K222#15X7RF5### | K222#10X7RH5### | K222#15X7RH5### | K222#15X7RK5### | K222#15X7RL5##5 |
| 2700 | K272#10X7RF5### | K272#15X7RF5### | K272#10X7RH5### | K272#15X7RH5### | K272#15X7RK5### | K272#15X7RL5##5 |
| 3300 | K332#10X7RF5### | K332#15X7RF5### | K332#10X7RH5### | K332#15X7RH5### | K332#15X7RK5### | K332#20X7RL5##5 |
| 3900 | K392#10X7RF5### | K392#15X7RF5### | K392#10X7RH5### | K392#15X7RH5### | K392#15X7RK5### | K392#20X7RL5##5 |
| 4700 | K472#10X7RF5### | K472#15X7RF5### | K472#10X7RH5### | K472#15X7RH5### | K472#15X7RK5### | K472#20X7RL5##5 |
| 5600 | K562#10X7RF5### | K562#15X7RF5### | K562#10X7RH5### | K562#15X7RH5### | K562#15X7RK5### | K562#20X7RL5##5 |
| 6800 | K682#10X7RF5### | K682#15X7RF5### | K682#10X7RH5### | K682#15X7RH5### | K682#15X7RK5### | K682#20X7RL5##5 |
| 8200 | K822#10X7RF5### | K822#15X7RF5### | K822#10X7RH5### | K822#15X7RH5### | K822#15X7RK5### | K822#20X7RL5##5 |
| 10 000 | K103#10X7RF5### | K103#15X7RF5### | K103#10X7RH5### | K103#15X7RH5### | K103#15X7RK5### | K103#20X7RL5##5 |
| 12 000 | K123#10X7RF5### | K123#15X7RF5### | - | K123#15X7RH5### | K123#15X7RK5### | K123#20X7RL5##5 |
| 15 000 | K153#10X7RF5### | K153#15X7RF5### | - | K153#15X7RH5### | K153#15X7RK5### | K153#20X7RL5##5 |
| 18 000 | K183#10X7RF5### | K183#15X7RF5### | - | K183#15X7RH5### | K183#15X7RK5### | K183#20X7RL5##5 |
| 22 000 | K223#10X7RF5### | K223#15X7RF5### | - | K223#15X7RH5### | K223#15X7RK5### | K223#20X7RL5##5 |
| 27 000 | K273#10X7RF5### | K273#15X7RF5### | - | K273#20X7RH5### | K273#20X7RK5### | K273#20X7RL5##5 |
| 33 000 | K333#10X7RF5### | K333#15X7RF5### | - | K333#20X7RH5### | K333#20X7RK5### | K333#20X7RL5##5 |
| 39 000 | K393#10X7RF5### | K393#15X7RF5### | - | K393#20X7RH5### | K393#20X7RK5### | K393#20X7RL5##5 |
| 47 000 | K473#10X7RF5### | K473#15X7RF5### | - | K473#20X7RH5### | K473#20X7RK5### | K473#20X7RL5##5 |
| 56 000 | K563#10X7RF5### | K563#15X7RF5### | - | K563#20X7RH5### | K563#20X7RK5### | - |
| 68 000 | K683#10X7RF5### | K683#15X7RF5### | - | K683#20X7RH5### | K683#20X7RK5### | - |
| 82 000 | K823#10X7RF5### | K823#15X7RF5### | - | K823#20X7RH5### | K823#20X7RK5### | - |
| 100 000 | K104#10X7RF5### | K104#15X7RF5### | - | K104#20X7RH5### | K104#20X7RK5### | - |
| 150 000 | - | K154#20X7RF5### | - | K154#20X7RH5### | K154#20X7RK5### | - |
| 220 000 | - | K224#20X7RF5### | - | K224#20X7RH5### | K224#20X7RK5### | - |
| 330 000 | - | K334#20X7RF5### | - | K334#20X7RH5### | - | - |
| 470 000 | - | K474#20X7RF5### | - | K474#20X7RH5### | - | - |
| 560 000 | - | K564#20X7RF5### | - | K564#20X7RH5### | - | - |
| 680 000 | - | K684#20X7RF5### | - | - | - | - |
| 1 000 000 | - | K105#20X7RF5### | - | - | - | - |

Notes

- Lead diameter is 0.5 mm
- # 5th digit is capacitance tolerance code: ± 10 % = K; ± 20 % = M
- # 13th digit is packaging code: bulk = 3; reel = T; ammo = U
- # 14th digit is lead style code: L; H; K (L and H are preferred lead configuration)
- # 15th digit is lead spacing code: 2.5 mm = 2; 5.0 mm = 5



TAPING AND PACKAGING

LABELLING

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

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

On special request other designations can be shown.

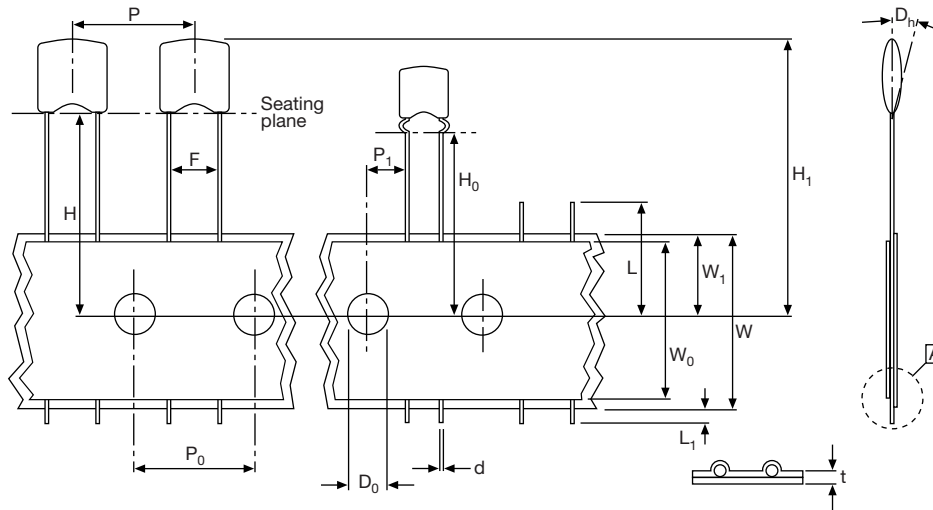
For example:



Table with 4 columns: PACKAGING, SIZE CODE, SMALLEST PACKAGING QUANTITY (SPQ), and BOX DIMENSIONS L x W x H (mm). Rows include Tape on reel, Ammopack, and Bulk.

Note

(1) SPQ contains one or a multiple of poly-bags, 1000 units per bag

CAPACITORS ON TAPE


| PARAMETER | SYMBOL | DIMENSIONS | |
|---|----------------|---------------------|-----------------------|
| | | mm | INCH |
| Cut-off length | L | ≤ 11.0 | ≤ 0.443 |
| Lead end protrusion | L ₁ | ≤ 1.0 | ≤ 0.039 |
| Height to seating plane (straight leads) | H | ≥ 18.0 | ≥ 0.709 |
| Height to seating plane (crimp leads) | H ₀ | 16.0 ± 0.5 | 0.630 ± 0.020 |
| Top of component height | H ₁ | ≤ 32 | ≤ 1.26 |
| Body inclination | Δh | 0.0 ± 1.0 | 0.000 ± 0.039 |
| Carrier tape width | W | 18.0 + 1.0/- 0.5 | 0.709 + 0.039/- 0.020 |
| Hold down tape width | W ₀ | 15.0 REF. | 0.591 REF. |
| Sprocket hole position | W ₁ | 9.00 + 0.075/- 0.50 | 0.354 + 0.030/- 0.020 |
| Lead space | F | 2.50 + 0.60/- 0.40 | 0.100 + 0.024/- 0.016 |
| | | 5.00 + 0.60/- 0.40 | 0.200 + 0.024/- 0.016 |
| Sprocket hole pitch | P ₀ | 12.70 ± 0.3 | 0.500 ± 0.012 |
| Sprocket hole center to lead center at F = 2.5 mm | P ₁ | 5.08 ± 0.7 | 0.200 ± 0.028 |
| Sprocket hole center to lead center at F = 5 mm | | 3.85 ± 0.7 | 0.150 ± 0.028 |
| Sprocket hole diameter | D ₀ | 4.00 ± 0.30 | 0.157 ± 0.012 |
| Overall tape thickness | t | ≤ 0.90 | ≤ 0.035 |
| Wire lead diameter | d | 0.50 ± 0.05 | 0.020 ± 0.002 |
| Taping pitch | P | 12.7 REF. | 0.50 REF. |

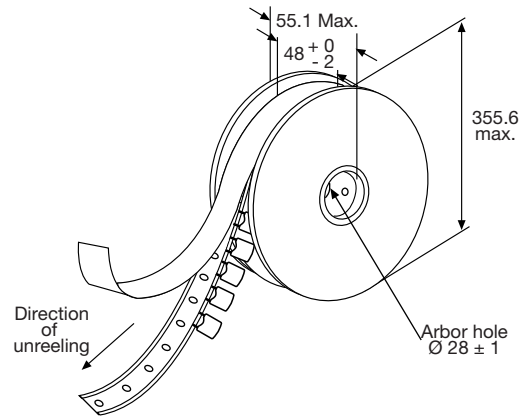
REEL DATA

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 (50 mm tape).

Maximum of 5 splicers per reel.

REEL


| REEL DIMENSIONS | | | |
|-----------------|----------------|--|------------|
| | | | |
| REEL SIZE | | | (mm) |
| A | Outer diameter | | 355.6 max. |
| L | Hole diameter | | 28 ± 1.5 |
| K | Core diameter | | 90 |
| H ₁ | Internal width | | 48 + 0/- 2 |
| H ₂ | External width | | 55 max. |

AMMOPACK DATA

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

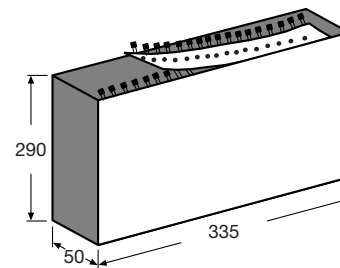
A maximum of 2 consecutive vacant positions is followed by 6 consecutive components.

Tape begins and ends with a minimum of 4 empty positions (50 mm tape).

Maximum of 5 splicers per reel.

The cumulative pitch tolerance over 20 consecutive units is not to exceed ± 1.0 mm.

Lead space (F) shall be measured at (3.6 ± 0.5) mm from the capacitor seating plane.

AMMOPACK


| RELATED DOCUMENTS | |
|---------------------|--|
| General Information | www.vishay.com/doc?45163 |



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