

Axial Leaded Multilayer Ceramic Capacitors for Automotive Applications

Class 1 and Class 2, 50 V_{DC}, 100 V_{DC}, 200 V_{DC}



FEATURES

- AEC-Q200 qualified with PPAP available
- High reliability MLCC insert with wet build process
- High operating temperature up to 160 °C
- High capacitance with small size
- Axial mounting style
- Parts compliant with ELV directive
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

 AUTOMOTIVE
GRADE

RoHS
COMPLIANT

APPLICATIONS

- Automotive

| QUICK REFERENCE DATA | | | | | | |
|----------------------------|--------|--------|------|-----------|---------|---------|
| DESCRIPTION | VALUE | | | | | |
| Ceramic class | 1 | | | 2 | | |
| Ceramic dielectric | C0G | | | X7R | | |
| Voltage (V _{DC}) | 50 | 100 | 200 | 50 | 100 | 200 |
| Min. capacitance (pF) | 100 | 100 | 100 | 330 | 330 | 330 |
| Max. capacitance (pF) | 12 000 | 12 000 | 8200 | 1 000 000 | 470 000 | 180 000 |
| Mounting | Axial | | | | | |

MARKING

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

OPERATING TEMPERATURE RANGE

-55 °C to +160 °C (50 % rated voltage above 150 °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

AEC-Q200

DESIGN

- The capacitors consist of a high reliability MLCC
- The lead wires are 0.5 mm and are made of 100 % tinned copper clad steel wire
- Coating is made of yellow colored flame retardant epoxy resin in accordance with UL 94 V-0

CAPACITANCE RANGE

100 pF to 1 μF

TOLERANCE ON CAPACITANCE

± 5 %, ± 10 %, ± 20 %

RATED VOLTAGE

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

TEST VOLTAGE

- 50 V_{DC} and 100 V_{DC}: 250 % of rated voltage
- 200 V_{DC}: 200 % of rated voltage

INSULATION RESISTANCE

100 GΩ or 1000 ΩF whichever is less at rated voltage within 2 min of charging.

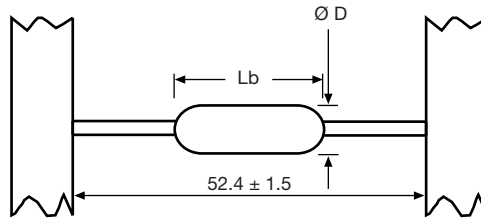
DISSIPATION FACTOR

Class 1: 0.1 % max.

(at 1 MHz, 1 V where C ≤ 1000 pF;
at 1 kHz; 1 V where C > 1000 pF)

Class 2: 2.5 % max.

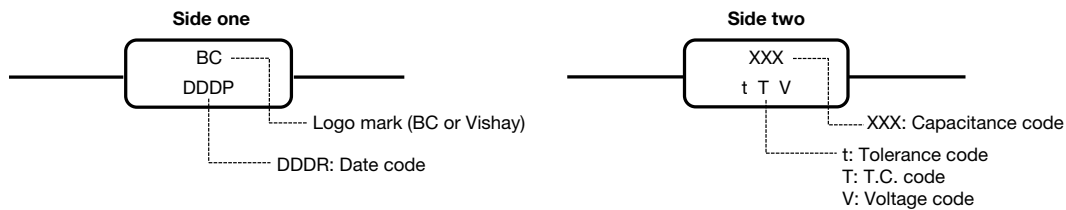
(at 1 kHz, 1 V)

DIMENSIONS (in millimeters)


| SIZE CODE | Lb _{MAX.} | ØD _{MAX.} |
|-----------|--------------------|--------------------|
| 15 | 3.8 | 2.6 |
| 20 | 5.1 | 3.1 |

Note

- The leads are matte tinned FeCu wire

MARKING

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. For example: 109 = 2011, 9 th week 217 = 2012, 17 th week | Two significant digits followed by one digit for the multiplier as given below. 1 = * 10, 2 = * 100, 3 = * 1000, 4 = * 10 000, 5 = * 100 000 | J = ± 5 % K = ± 10 % M = ± 20 % | 1 = 100 V 2 = 200 V 5 = 50 V | A = C0G (NP0) C = X7R |

ORDERING CODE INFORMATION

| A | 104 | K | 15 | X7R | F | 5 | TAA | P |
|-----------------------|--|---------------------------------------|------------------------------------|------------------------------------|--|-----------------------|--------------------------|---|
| 1 | 2 3 4 | 5 | 6 7 | 8 9 10 | 11 | 12 | 13 14 15 | 16 |
| Product Type | Capacitance (pF) | Capacitance Tolerance | Size Code | TC Code | Rated Voltage | Lead Diameter | Packaging | AEC-Q200 Qualified |
| A = axial leaded MLCC | The first two digits are the significant figures of capacitance and the last digit is a multiplier as follows: 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} | 5 = 0.50 mm ± 0.05 mm | TAA = reel UAA = ammo | P = AEC-Q200 qualified and lead (Pb)-free |



ORDERING CODES

| DIELECTRIC COG | | | |
|----------------|---------------------------------|---------------------------------|---------------------------------|
| CAP. (pF) | 50 V _{DC} | 100 V _{DC} | 200 V _{DC} |
| 100 | A101#15C0GF5###P | A101#15C0GH5###P | A101#15C0GK5###P |
| 120 | A121#15C0GF5###P | A121#15C0GH5###P | A121#15C0GK5###P |
| 150 | A151#15C0GF5###P | A151#15C0GH5###P | A151#15C0GK5###P |
| 180 | A181#15C0GF5###P | A181#15C0GH5###P | A181#15C0GK5###P |
| 220 | A221#15C0GF5###P | A221#15C0GH5###P | A221#15C0GK5###P |
| 270 | A271#15C0GF5###P | A271#15C0GH5###P | A271#15C0GK5###P |
| 330 | A331#15C0GF5###P | A331#15C0GH5###P | A331#15C0GK5###P |
| 390 | A391#15C0GF5###P | A391#15C0GH5###P | A391#15C0GK5###P |
| 470 | A471#15C0GF5###P | A471#15C0GH5###P | A471#15C0GK5###P |
| 560 | A561#15C0GF5###P | A561#15C0GH5###P | A561#15C0GK5###P |
| 680 | A681#15C0GF5###P | A681#15C0GH5###P | A681#15C0GK5###P |
| 820 | A821#15C0GF5###P | A821#15C0GH5###P | A821#15C0GK5###P |
| 1000 | A102#15C0GF5###P | A102#15C0GH5###P | A102#15C0GK5###P |
| 1200 | A122#15C0GF5###P | A122#15C0GH5###P | A122#20C0GK5###P |
| 1500 | A152#15C0GF5###P | A152#15C0GH5###P | A152#20C0GK5###P |
| 1800 | A182#15C0GF5###P | A182#15C0GH5###P | A182#20C0GK5###P |
| 2200 | A222#15C0GF5###P | A222#20C0GH5###P | A222#20C0GK5###P |
| 2700 | A272#15C0GF5###P | A272#20C0GH5###P | A272#20C0GK5###P |
| 3300 | A332#15C0GF5###P | A332#20C0GH5###P | A332#20C0GK5###P |
| 3900 | A392#15C0GF5###P | A392#20C0GH5###P | A392#20C0GK5###P ⁽¹⁾ |
| 4700 | A472#20C0GF5###P | A472#20C0GH5###P | A472#20C0GK5###P ⁽¹⁾ |
| 5600 | A562#20C0GF5###P | A562#20C0GH5###P | A562#20C0GK5###P ⁽¹⁾ |
| 6800 | A682#20C0GF5###P | A682#20C0GH5###P | A682#20C0GK5###P ⁽¹⁾ |
| 8200 | A822#20C0GF5###P | A822#20C0GH5###P | A822#20C0GK5###P ⁽¹⁾ |
| 12 000 | A123#20C0GF5###P ⁽¹⁾ | A123#20C0GH5###P ⁽¹⁾ | - |

Notes

- Lead diameter is 0.5 mm
 - # 5th digit is capacitance tolerance code: ± 5 % = J; ± 10 % = K
 - # 13th, 14th and 15th digits are packaging code: reel = TAA; ammo = UAA
- ⁽¹⁾ Ø D is 4.5 mm max.



| DIELECTRIC X7R | | | |
|----------------|---------------------------------|---------------------------------|---------------------------------|
| CAP. (pF) | 50 V _{DC} | 100 V _{DC} | 200 V _{DC} |
| 330 | A331#15X7RF5###P | A331#15X7RH5###P | A331#15X7RK5###P |
| 390 | A391#15X7RF5###P | A391#15X7RH5###P | A391#15X7RK5###P |
| 470 | A471#15X7RF5###P | A471#15X7RH5###P | A471#15X7RK5###P |
| 560 | A561#15X7RF5###P | A561#15X7RH5###P | A561#15X7RK5###P |
| 680 | A681#15X7RF5###P | A681#15X7RH5###P | A681#15X7RK5###P |
| 820 | A821#15X7RF5###P | A821#15X7RH5###P | A821#15X7RK5###P |
| 1000 | A102#15X7RF5###P | A102#15X7RH5###P | A102#15X7RK5###P |
| 1200 | A122#15X7RF5###P | A122#15X7RH5###P | A122#15X7RK5###P |
| 1500 | A152#15X7RF5###P | A152#15X7RH5###P | A152#15X7RK5###P |
| 1800 | A182#15X7RF5###P | A182#15X7RH5###P | A182#15X7RK5###P |
| 2200 | A222#15X7RF5###P | A222#15X7RH5###P | A222#15X7RK5###P |
| 2700 | A272#15X7RF5###P | A272#15X7RH5###P | A272#15X7RK5###P |
| 3300 | A332#15X7RF5###P | A332#15X7RH5###P | A332#15X7RK5###P |
| 3900 | A392#15X7RF5###P | A392#15X7RH5###P | A392#15X7RK5###P |
| 4700 | A472#15X7RF5###P | A472#15X7RH5###P | A472#15X7RK5###P |
| 5600 | A562#15X7RF5###P | A562#15X7RH5###P | A562#15X7RK5###P |
| 6800 | A682#15X7RF5###P | A682#15X7RH5###P | A682#15X7RK5###P |
| 8200 | A822#15X7RF5###P | A822#15X7RH5###P | A822#15X7RK5###P |
| 10 000 | A103#15X7RF5###P | A103#15X7RH5###P | A103#15X7RK5###P |
| 12 000 | A123#15X7RF5###P | A123#15X7RH5###P | A123#15X7RK5###P |
| 15 000 | A153#15X7RF5###P | A153#15X7RH5###P | A153#15X7RK5###P |
| 18 000 | A183#15X7RF5###P | A183#15X7RH5###P | A183#15X7RK5###P |
| 22 000 | A223#15X7RF5###P | A223#15X7RH5###P | A223#15X7RK5###P |
| 27 000 | A273#15X7RF5###P | A273#15X7RH5###P | A273#15X7RK5###P |
| 33 000 | A333#15X7RF5###P | A333#15X7RH5###P | A333#20X7RK5###P |
| 39 000 | A393#15X7RF5###P | A393#15X7RH5###P | A393#20X7RK5###P |
| 47 000 | A473#15X7RF5###P | A473#15X7RH5###P | A473#20X7RK5###P |
| 56 000 | A563#15X7RF5###P | A563#15X7RH5###P | A563#20X7RK5###P |
| 68 000 | A683#15X7RF5###P | A683#15X7RH5###P | A683#20X7RK5###P |
| 82 000 | A823#15X7RF5###P | A823#15X7RH5###P | A823#20X7RK5###P |
| 100 000 | A104#15X7RF5###P | A104#15X7RH5###P | A104#20X7RK5###P |
| 120 000 | A124#15X7RF5###P | A124#20X7RH5###P | A124#20X7RK5###P |
| 150 000 | A154#20X7RF5###P | A154#20X7RH5###P | A154#20X7RK5###P ⁽¹⁾ |
| 180 000 | A184#20X7RF5###P | A184#20X7RH5###P | A184#20X7RK5###P ⁽¹⁾ |
| 220 000 | A224#20X7RF5###P | A224#20X7RH5###P | - |
| 270 000 | A274#20X7RF5###P | A274#20X7RH5###P | - |
| 330 000 | A334#20X7RF5###P | A334#20X7RH5###P ⁽¹⁾ | - |
| 390 000 | A394#20X7RF5###P | A394#20X7RH5###P ⁽¹⁾ | - |
| 470 000 | A474#20X7RF5###P | A474#20X7RH5###P ⁽¹⁾ | - |
| 560 000 | A564#20X7RF5###P ⁽¹⁾ | - | - |
| 680 000 | A684#20X7RF5###P ⁽¹⁾ | - | - |
| 820 000 | A824#20X7RF5###P ⁽¹⁾ | - | - |
| 1 000 000 | A105#20X7RF5###P ⁽¹⁾ | - | - |

Notes

- Lead diameter is 0.5 mm
 - # 5th digit is capacitance tolerance code: ± 10 % = K; ± 20 % = M
 - # 13th, 14th and 15th digits are packaging code: reel = TAA; ammo = UAA
- ⁽¹⁾ Ø D is 4.5 mm max.



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.

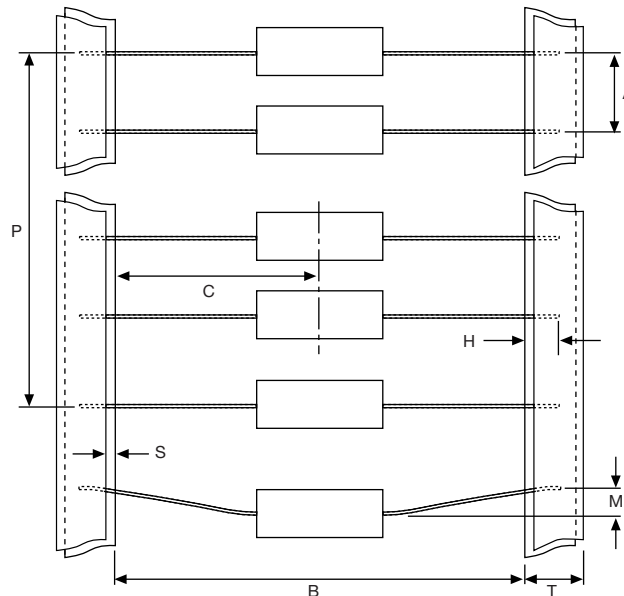
On special request other designations can be shown.

For example:



| PACKAGING QUANTITIES AND BOX DIMENSIONS | | | |
|---|--|-----------------------------------|-------------------------------|
| PACKAGING | SIZE CODE | SMALLEST PACKAGING QUANTITY (SPQ) | BOX DIMENSIONS L x W x H (mm) |
| Tape on reel | 15, 20 | 7000 | 370 x 370 x 90 |
| | Ordering code marked with ⁽¹⁾ | 5000 | |
| Ammopack | 15, 20 | 4000 | 265 x 85 x 95 |
| | Ordering code marked with ⁽¹⁾ | 2000 | |

CAPACITORS ON BANDOLIERS FOR DIPPED AXIAL



| PARAMETER | SYMBOL | DIMENSIONS | |
|--|------------------|------------|---------------|
| | | mm | INCH |
| Inside tape spacing | B ⁽¹⁾ | 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 ± 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

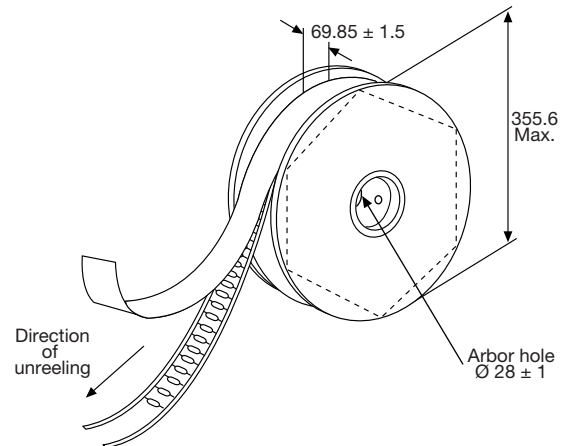
A maximum of 0.5 % of the total number of capacitors per reel may be missing.

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



| REEL DIMENSIONS | | |
|-----------------|----------------|------------|
| | | |
| REEL SIZE | | (mm) |
| A | Outer diameter | 355.6 max. |
| L | Hole diameter | 28 ± 1 |
| K | Core diameter | 90 |
| H ₁ | Internal width | 69.9 ± 1.5 |

AMMOPACK DATA

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

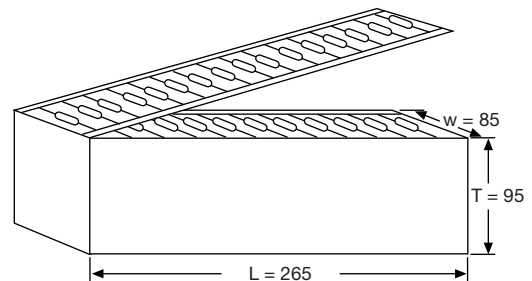
A maximum of 1 consecutive vacant positions is followed by 6 consecutive components.

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

Maximum of 5 splicers per pack.

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

AMMOPACK



| RELATED DOCUMENTS | |
|---------------------|--|
| General Information | www.vishay.com/doc?45214 |



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