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

Pb-free

e3

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

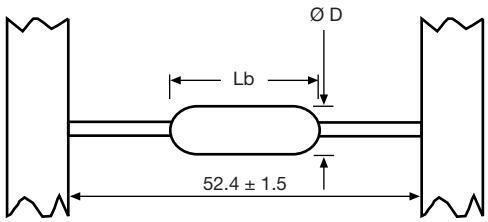
100 GΩ or 1000 ΩF whichever is less at rated voltage within 2 min of charging.

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)

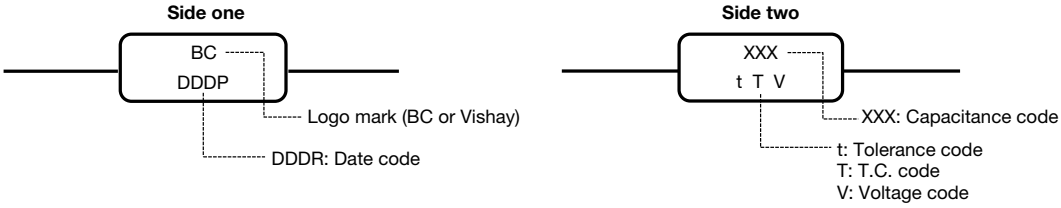


SIZE CODE	$Lb_{MAX.}$	$ØD_{MAX.}$
15	3.8	2.6
20	5.1	3.1

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, 9th week 217 = 2012, 17th 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 C0G			
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)
10 000	A103#20C0GF5###P	A103#20C0GH5###P	-
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:

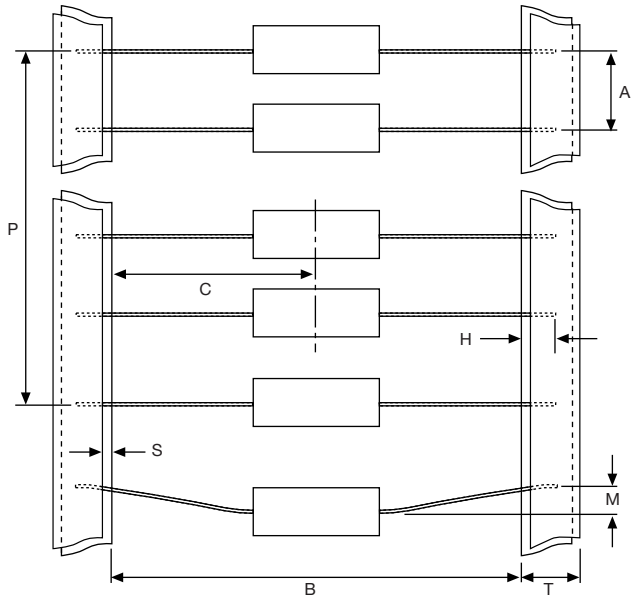
manufacturer, A style, capacitance, tolerance, batch number, quantity of components, rated voltage, dielectric.

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
Ammopack	15, 20	4000	265 x 85 x 95

CAPACITORS ON BANDOLIER 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

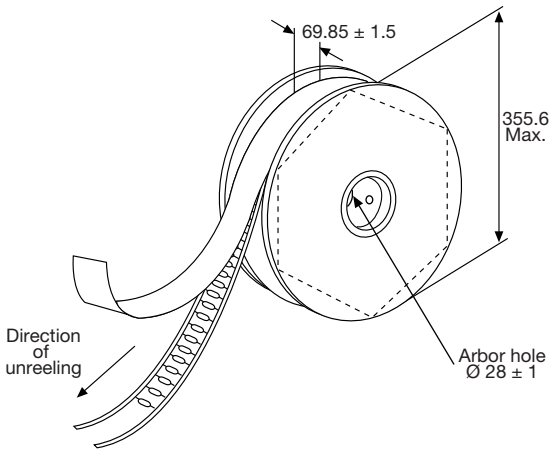
A maximum of 0.5 % of the total number of capacitors per reel may be missing.

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

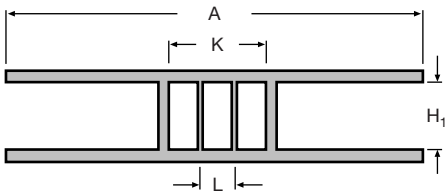
Tape begins and ends with a minimum of 4 empty positions (180 mm tape).

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.

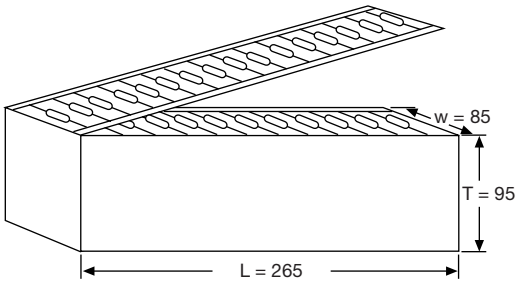
A maximum of 1 consecutive vacant positions is followed by 6 consecutive components.

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

Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, “Vishay”), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay’s knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer’s responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer’s technical experts. Product specifications do not expand or otherwise modify Vishay’s terms and conditions of purchase, including but not limited to the warranty expressed therein.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.