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
- For new designs the series A...P is recommended (www.vishay.com/ppg?45249)
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

APPLICATIONS

- Automotive

QUICK REFERENCE DATA								
DESCRIPTION	VALUE							
Ceramic class	1			2				
Ceramic dielectric	C0G			X7R			X8R	
Voltage (V_{DC})	50	100	200	50	100	200	50	100
Min. capacitance (pF)	100	100	100	470	470	330	470	470
Max. capacitance (pF)	8200	8200	1000	1 000 000	470 000	68 000	150 000	27 000
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, X8R

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

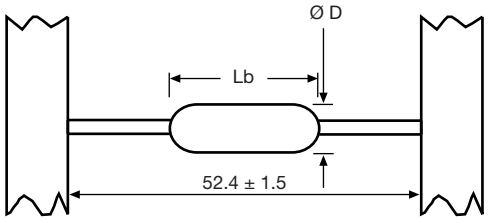
100 GΩ or 1000 ΩF whichever is less at rated voltage within 2 min of charging.

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)

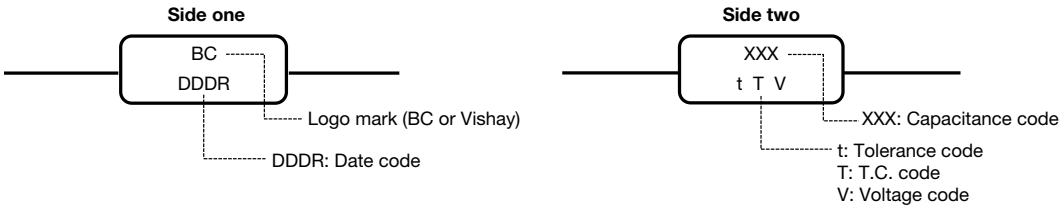


SIZE CODE	$Lb_{MAX.}$	$ØD_{MAX.}$
15	3.8	2.6
20	5.1	3.1

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	R
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	R = AEC-Q200 qualified and RoHS compliant

ORDERING CODES

DIELECTRIC C0G			
CAP. (pF)	50 V_{DC}	100 V_{DC}	200 V_{DC}
100	A101#15C0GF5###R	A101#15C0GH5###R	A101#15C0GK5###R
120	A121#15C0GF5###R	A121#15C0GH5###R	A121#15C0GK5###R
150	A151#15C0GF5###R	A151#15C0GH5###R	A151#15C0GK5###R
180	A181#15C0GF5###R	A181#15C0GH5###R	A181#15C0GK5###R
220	A221#15C0GF5###R	A221#15C0GH5###R	A221#15C0GK5###R
270	A271#15C0GF5###R	A271#15C0GH5###R	A271#15C0GK5###R
330	A331#15C0GF5###R	A331#15C0GH5###R	A331#15C0GK5###R
390	A391#15C0GF5###R	A391#15C0GH5###R	A391#15C0GK5###R
470	A471#15C0GF5###R	A471#15C0GH5###R	A471#15C0GK5###R
560	A561#15C0GF5###R	A561#15C0GH5###R	A561#15C0GK5###R
680	A681#15C0GF5###R	A681#15C0GH5###R	A681#15C0GK5###R
820	A821#15C0GF5###R	A821#15C0GH5###R	A821#15C0GK5###R
1000	A102#15C0GF5###R	A102#15C0GH5###R	A102#15C0GK5###R
1200	A122#15C0GF5###R	A122#15C0GH5###R	-
1500	A152#15C0GF5###R	A152#15C0GH5###R	-
1800	A182#15C0GF5###R	A182#15C0GH5###R	-
2200	A222#15C0GF5###R	A222#20C0GH5###R	-
2700	A272#15C0GF5###R	A272#20C0GH5###R	-
3300	A332#15C0GF5###R	A332#20C0GH5###R	-
3900	A392#15C0GF5###R	A392#20C0GH5###R	-
4700	A472#20C0GF5###R	A472#20C0GH5###R	-
5600	A562#20C0GF5###R	A562#20C0GH5###R	-
6800	A682#20C0GF5###R	A682#20C0GH5###R	-
8200	A822#20C0GF5###R	A822#20C0GH5###R	-

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

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

Notes

(1) The Ø D is 4.5 mm max.

- 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

DIELECTRIC X8R		
CAP. (pF)	50 V_{DC}	100 V_{DC}
470	A471#15X8RF5###R	A471#15X8RH5###R
560	A561#15X8RF5###R	A561#15X8RH5###R
680	A681#15X8RF5###R	A681#15X8RH5###R
820	A821#15X8RF5###R	A821#15X8RH5###R
1000	A102#15X8RF5###R	A102#15X8RH5###R
1200	A122#15X8RF5###R	A122#15X8RH5###R
1500	A152#15X8RF5###R	A152#15X8RH5###R
1800	A182#15X8RF5###R	A182#15X8RH5###R
2200	A222#15X8RF5###R	A222#15X8RH5###R
2700	A272#15X8RF5###R	A272#15X8RH5###R
3300	A332#15X8RF5###R	A332#15X8RH5###R
3900	A392#15X8RF5###R	A392#15X8RH5###R
4700	A472#15X8RF5###R	A472#15X8RH5###R
5600	A562#15X8RF5###R	A562#15X8RH5###R
6800	A682#15X8RF5###R	A682#15X8RH5###R
8200	A822#15X8RF5###R	A822#15X8RH5###R
10 000	A103#15X8RF5###R	A103#15X8RH5###R
12 000	A123#15X8RF5###R	A123#15X8RH5###R
15 000	A153#15X8RF5###R	A153#15X8RH5###R
18 000	A183#15X8RF5###R	A183#15X8RH5###R
22 000	A223#15X8RF5###R	A223#15X8RH5###R
27 000	A273#15X8RF5###R	A273#15X8RH5###R
33 000	A333#15X8RF5###R	-
39 000	A393#15X8RF5###R	-
47 000	A473#15X8RF5###R	-
56 000	A563#15X8RF5###R	-
68 000	A683#20X8RF5###R	-
82 000	A823#20X8RF5###R	-
100 000	A104#20X8RF5###R	-
150 000	A154#20X8RF5###R	-

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

TAPING AND PACKAGING

LABELLING

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

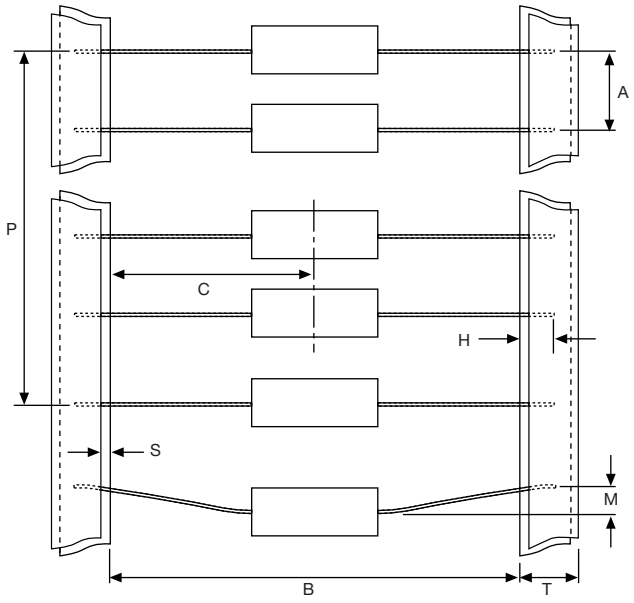
manufacturer, A style, capacitance, tolerance, batch number, quantity of components, rated voltage, dielectric.

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

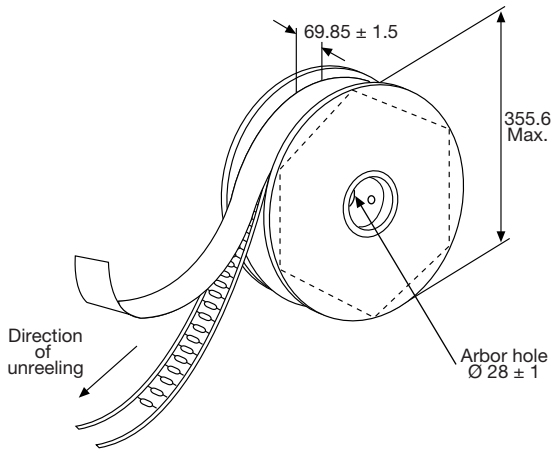
A maximum of 0.5 % of the total number of capacitors per reel may be missing.

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

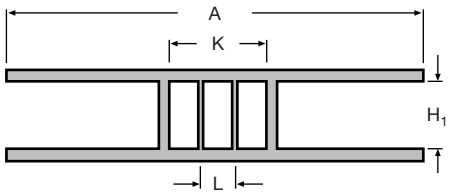
Tape begins and ends with a minimum of 4 empty positions (180 mm tape).

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.

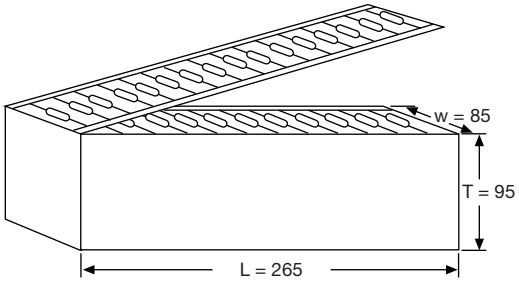
A maximum of 1 consecutive vacant positions is followed by 6 consecutive components.

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

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