Axial Leaded Multilayer Ceramic Capacitors for Automotive Applications Class 1 and Class 2, 50 V_{DC}, 100 V_{DC}, 200 V_{DC}

FEATURES

- Good performance for motor driver and sensor
- AEC-Q200 qualified with PPAP available
- Alleviation for mechanical stress
- Assembly friendly
- Parts compliant with ELV directive
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free

e3

RoHS COMPLIANT

HALOGEN FREE

APPLICATIONS

- Automotive
- Motor driver and sensor
- Speed sensor
- Wiper motor
- Power window motor

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)	10	10	10	100	100	100
Max. capacitance (pF)	47 000	47 000	15 000	1 000 000	220 000	22 000
Mounting	Axial					

MARKING

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

OPERATING TEMPERATURE RANGE

-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

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 blue 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}

TEST VOLTAGE

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

INSULATION RESISTANCE

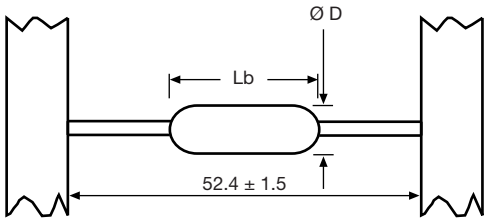
≥ 10 GΩ or R x C ≥ 100 ΩF whichever is less at rated voltage within 2 min of charging.

DISSIPATION FACTOR OR Q VALUE

Class 1: cap. ≥ 30 pF, Q ≥ 1000
cap. < 30 pF, Q ≥ 400 + 20C
(at 1 MHz, 1 V where C ≤ 1000 pF;
at 1 kHz; 1 V where C > 1000 pF)

Class 2: DF ≤ 2.5 %, cap. < 0.18 µF
DF ≤ 3.0 %, cap. ≥ 0.18 µF
(at 1 kHz, 1 V)

DIMENSIONS (in millimeters)



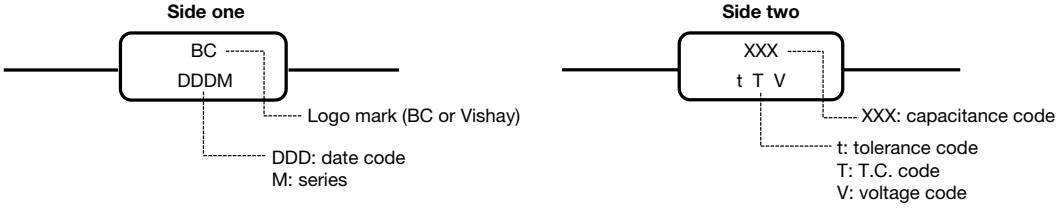
SIZE CODE	$Lb_{MAX.}$	$ØD_{MAX.}$
15	3.8	2.6
20	5.1	3.1
20	5.1	4.5 (1)

Notes

- The leads are matte tinned FeCu wire

(1) Please refer to “Ordering Codes”

MARKING



MARKING CODE DESCRIPTION

DDDW	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

MDSA	104	K	15	X	F	5	###
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**
MDSA = 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	X stands for X7R C stands for C0G	F = 50 V_{DC} H = 100 V_{DC} K = 200 V_{DC}	5 = 0.50 mm ± 0.05 mm	TAA = reel UAA = ammo

ORDERING CODES

DIELECTRIC C0G			
CAP. (pF)	50 V_{DC}	100 V_{DC}	200 V_{DC}
10	MDSA100#15CF5###	MDSA100#15CH5###	MDSA100#15CK5###
12	MDSA120#15CF5###	MDSA120#15CH5###	MDSA120#15CK5###
15	MDSA150#15CF5###	MDSA150#15CH5###	MDSA150#15CK5###
18	MDSA180#15CF5###	MDSA180#15CH5###	MDSA180#15CK5###
22	MDSA220#15CF5###	MDSA220#15CH5###	MDSA220#15CK5###
27	MDSA270#15CF5###	MDSA270#15CH5###	MDSA270#15CK5###
33	MDSA330#15CF5###	MDSA330#15CH5###	MDSA330#15CK5###
39	MDSA390#15CF5###	MDSA390#15CH5###	MDSA390#15CK5###
47	MDSA470#15CF5###	MDSA470#15CH5###	MDSA470#15CK5###
56	MDSA560#15CF5###	MDSA560#15CH5###	MDSA560#15CK5###
68	MDSA680#15CF5###	MDSA680#15CH5###	MDSA680#15CK5###
82	MDSA820#15CF5###	MDSA820#15CH5###	MDSA820#15CK5###
100	MDSA101#15CF5###	MDSA101#15CH5###	MDSA101#15CK5###
120	MDSA121#15CF5###	MDSA121#15CH5###	MDSA121#15CK5###
150	MDSA151#15CF5###	MDSA151#15CH5###	MDSA151#15CK5###
180	MDSA181#15CF5###	MDSA181#15CH5###	MDSA181#15CK5###
220	MDSA221#15CF5###	MDSA221#15CH5###	MDSA221#15CK5###
270	MDSA271#15CF5###	MDSA271#15CH5###	MDSA271#15CK5###
330	MDSA331#15CF5###	MDSA331#15CH5###	MDSA331#15CK5###
390	MDSA391#15CF5###	MDSA391#15CH5###	MDSA391#15CK5###
470	MDSA471#15CF5###	MDSA471#15CH5###	MDSA471#15CK5###
560	MDSA561#15CF5###	MDSA561#15CH5###	MDSA561#15CK5###
680	MDSA681#15CF5###	MDSA681#15CH5###	MDSA681#15CK5###
820	MDSA821#15CF5###	MDSA821#15CH5###	MDSA821#15CK5###
1000	MDSA102#15CF5###	MDSA102#15CH5###	MDSA102#15CK5###
1200	MDSA122#15CF5###	MDSA122#15CH5###	MDSA122#15CK5###
1500	MDSA152#15CF5###	MDSA152#15CH5###	MDSA152#15CK5###
1800	MDSA182#15CF5###	MDSA182#15CH5###	MDSA182#15CK5###
2200	MDSA222#15CF5###	MDSA222#15CH5###	MDSA222#15CK5###
2700	MDSA272#15CF5###	MDSA272#15CH5###	MDSA272#15CK5###
3300	MDSA332#15CF5###	MDSA332#15CH5###	MDSA332#15CK5###
3900	MDSA392#15CF5###	MDSA392#15CH5###	MDSA392#15CK5###
4700	MDSA472#15CF5###	MDSA472#15CH5###	MDSA472#15CK5###
5600	MDSA562#15CF5###	MDSA562#15CH5###	MDSA562#20CK5###
6800	MDSA682#15CF5###	MDSA682#15CH5###	MDSA682#20CK5###
8200	MDSA822#15CF5###	MDSA822#15CH5###	MDSA822#20CK5###
10 000	MDSA103#15CF5###	MDSA103#15CH5###	MDSA103#20CK5###
12 000	MDSA123#15CF5###	MDSA123#20CH5###	MDSA123#20CK5### (1)
15 000	MDSA153#15CF5###	MDSA153#20CH5###	MDSA153#20CK5### (1)
18 000	MDSA183#15CF5###	MDSA183#20CH5### (1)	-
22 000	MDSA223#15CF5###	MDSA223#20CH5### (1)	-
27 000	MDSA273#20CF5### (1)	MDSA273#20CH5### (1)	-
33 000	MDSA333#20CF5### (1)	MDSA333#20CH5### (1)	-
39 000	MDSA393#20CF5### (1)	MDSA393#20CH5### (1)	-
47 000	MDSA473#20CF5### (1)	MDSA473#20CH5### (1)	-

Notes

- 8th digit is capacitance tolerance code: ± 5 % = J; ± 10 % = K

(1) Ø $D_{MAX.}$ = 4.5 mm

DIELECTRIC X7R			
CAP. (pF)	50 V_{DC}	100 V_{DC}	200 V_{DC}
101	MDSA101#15XF5###	MDSA101#15XH5###	MDSA101#15XK5###
221	MDSA221#15XF5###	MDSA221#15XH5###	MDSA221#15XK5###
330	MDSA331#15XF5###	MDSA331#15XH5###	MDSA331#15XK5###
390	MDSA391#15XF5###	MDSA391#15XH5###	MDSA391#15XK5###
470	MDSA471#15XF5###	MDSA471#15XH5###	MDSA471#15XK5###
560	MDSA561#15XF5###	MDSA561#15XH5###	MDSA561#15XK5###
680	MDSA681#15XF5###	MDSA681#15XH5###	MDSA681#15XK5###
820	MDSA821#15XF5###	MDSA821#15XH5###	MDSA821#15XK5###
1000	MDSA102#15XF5###	MDSA102#15XH5###	MDSA102#15XK5###
1200	MDSA122#15XF5###	MDSA122#15XH5###	MDSA122#15XK5###
1500	MDSA152#15XF5###	MDSA152#15XH5###	MDSA152#15XK5###
1800	MDSA182#15XF5###	MDSA182#15XH5###	MDSA182#15XK5###
2200	MDSA222#15XF5###	MDSA222#15XH5###	MDSA222#15XK5###
2700	MDSA272#15XF5###	MDSA272#15XH5###	MDSA272#15XK5###
3300	MDSA332#15XF5###	MDSA332#15XH5###	MDSA332#15XK5###
3900	MDSA392#15XF5###	MDSA392#15XH5###	MDSA392#15XK5###
4700	MDSA472#15XF5###	MDSA472#15XH5###	MDSA472#15XK5###
5600	MDSA562#15XF5###	MDSA562#15XH5###	MDSA562#15XK5###
6800	MDSA682#15XF5###	MDSA682#15XH5###	MDSA682#15XK5###
8200	MDSA822#15XF5###	MDSA822#15XH5###	MDSA822#15XK5###
10 000	MDSA103#15XF5###	MDSA103#15XH5###	MDSA103#15XK5###
12 000	MDSA123#15XF5###	MDSA123#15XH5###	MDSA123#15XK5###
15 000	MDSA153#15XF5###	MDSA153#15XH5###	MDSA153#15XK5###
18 000	MDSA183#15XF5###	MDSA183#15XH5###	MDSA183#15XK5###
22 000	MDSA223#15XF5###	MDSA223#15XH5###	MDSA223#15XK5###
27 000	MDSA273#15XF5###	MDSA273#15XH5###	-
33 000	MDSA333#15XF5###	MDSA333#15XH5###	-
39 000	MDSA393#15XF5###	MDSA393#15XH5###	-
47 000	MDSA473#15XF5###	MDSA473#15XH5###	-
56 000	MDSA563#15XF5###	MDSA563#15XH5###	-
68 000	MDSA683#15XF5###	MDSA683#15XH5###	-
82 000	MDSA823#15XF5###	MDSA823#15XH5###	-
100 000	MDSA104#15XF5###	MDSA104#15XH5###	-
120 000	MDSA124#15XF5###	MDSA124#20XH5###	-
150 000	MDSA154#15XF5###	MDSA154#20XH5###	-
180 000	MDSA184#15XF5###	MDSA184#20XH5###	-
220 000	MDSA224#15XF5###	MDSA224#20XH5###	-
270 000	MDSA274#15XF5###	-	-
330 000	MDSA334#15XF5###	-	-
390 000	MDSA394#15XF5###	-	-
470 000	MDSA474#15XF5###	-	-
560 000	MDSA564#20XF5###	-	-
680 000	MDSA684#20XF5###	-	-
820 000	MDSA824#20XF5###	-	-
1 000 000	MDSA105#20XF5###	-	-

Note

- 8th digit is capacitance tolerance code: ± 10 % = K; ± 20 % = M

TAPING AND PACKAGING

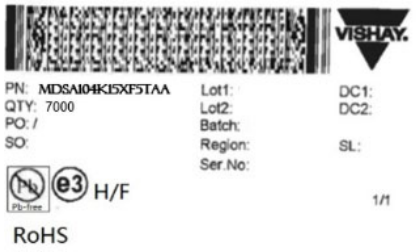
LABELLING

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

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

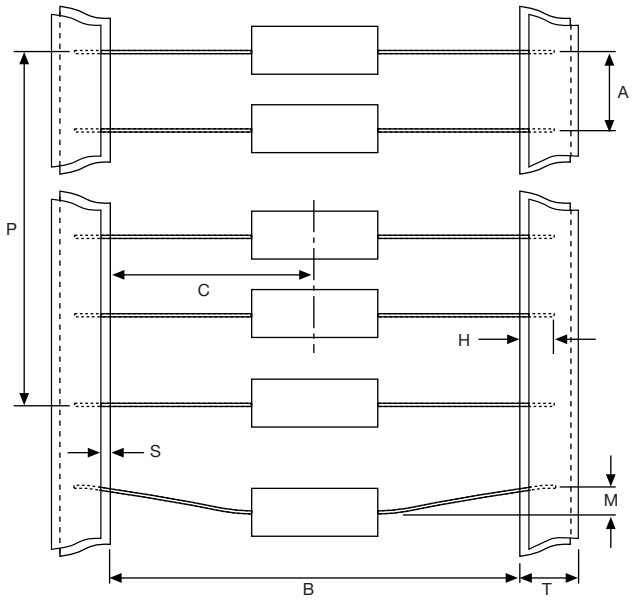
On special request other designations can be shown.

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

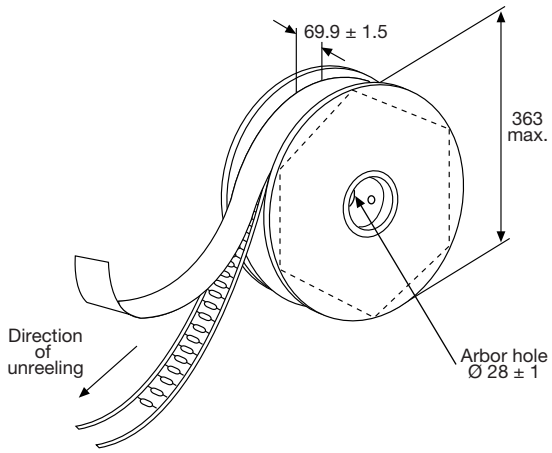
A maximum of 0.5 % of the total number of capacitors per reel may be missing.

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

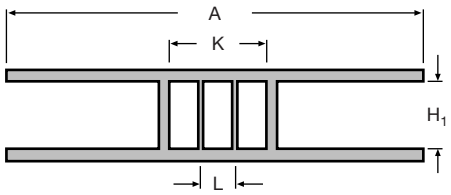
Tape begins and ends with a minimum of 4 empty positions (180 mm tape).

Maximum of 5 splicers per reel.

REEL



REEL DIMENSIONS



REEL SIZE		(mm)
A	Outer diameter	363 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.

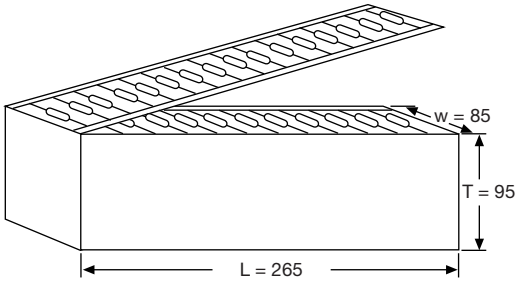
A maximum of 1 consecutive vacant positions is followed by 6 consecutive components.

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