VISHAY

150 CLZ

Vishay BCcomponents

Aluminum Capacitors
SMD (Chip), High Temperature

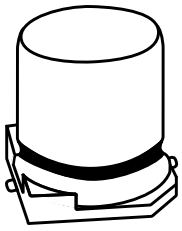
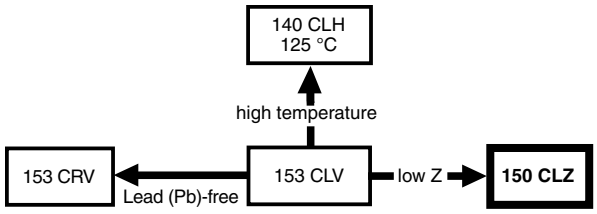


Fig.1 Component outline



FEATURES

- Polarized aluminum electrolytic capacitors, non-solid electrolyte, self healing
- SMD-version with base plate, reflow solderable
- Very low impedance, very high ripple current
- Very long useful life: 3000 hours at 105 °C
- Charge and discharge proof, no peak current limitation
- Lead (Pb)-free
- ATTENTION: for maximum safe soldering conditions refer to fig.4

APPLICATIONS

- SMD technology, for high mounting density
- Industrial and professional applications
- Automotive, general industrial
- Smoothing, filtering, buffering.

MARKING

- Rated capacitance (in µF)
- Rated voltage (in V)
- Date code, in accordance with IEC 60062
- Black mark or '-' sign indicating the cathode (the anode is identified by bevelled edges)
- Code indicating group number (Z)

PACKAGING

- Supplied in blister tape on reel

QUICK REFERENCE DATA

DESCRIPTION	VALUE
Nominal case sizes (L x W x H in mm)	8 x 8 x 10 to 10 x 10 x 14
Rated capacitance range, C_R	33 to 1000 µF
Tolerance on C_R	± 20 %
Rated voltage range, U_R	6.3 V to 63 V
Category temperature range	- 55 °C to + 105 °C
Endurance test at 105 °C:	2000 hours
Useful life at 105 °C: case size ≤ 10 x 10 x 10 case size 10 x 10 x 14	 2500 hours 3000 hours
Useful life at 40 °C; 1.8 x I_R applied: case size ≤ 10 x 10 x 10 case size 10 x 10 x 14	 125 000 hours 150 000 hours
Shelf life at 0 V, 105 °C	1000 hours
Based on sectional specification	IEC 60384-18/CECC32300
Climatic category IEC 60068	55/105/56

SELECTION CHART FOR C_R, U_R AND RELEVANT NOMINAL CASE SIZES (L x W x H in mm)

C_R (µF)	U_R (V)						
	6.3	10	16	25	35	50	63
33	-	-	-	-	-	-	8 x 8 x 10
47	-	-	-	-	-	-	8 x 8 x 10
	-	-	-	-	-	-	10 x 10 x 10
68	-	-	-	-	-	8 x 8 x 10	10 x 10 x 10
100	-	-	-	-	8 x 8 x 10	10 x 10 x 10	10 x 10 x 14
150	-	-	-	8 x 8 x 10	-	-	-
220	-	-	8 x 8 x 10	8 x 8 x 10	10 x 10 x 10	10 x 10 x 14	-
330	-	8 x 8 x 10	8 x 8 x 10	10 x 10 x 10	10 x 10 x 14	-	-
470	8 x 8 x 10	8 x 8 x 10	10 x 10 x 10	10 x 10 x 14	-	-	-
680	-	10 x 10 x 10	10 x 10 x 14	-	-	-	-
1000	10 x 10 x 10	10 x 10 x 14	-	-	-	-	-

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Table 1

DIMENSIONS in millimeters AND MASS									
NOMINAL CASE SIZE L x W x H	CASE CODE	$L_{max.}$	$W_{max.}$	$H_{max.}$	Ø D	$B_{max.}$	S	$L_{1\ max.}$	MASS (g)
8 x 8 x 10	0810	8.5	8.5	10.5	8.0	1.0	3.1	9.9	≈ 1.0
10 x 10 x 10	1010	10.5	10.5	10.5	10.0	1.0	4.5	11.8	≈ 1.3
10 x 10 x 14	1014	10.5	10.5	14.3	10.0	1.0	4.5	11.8	≈ 1.5

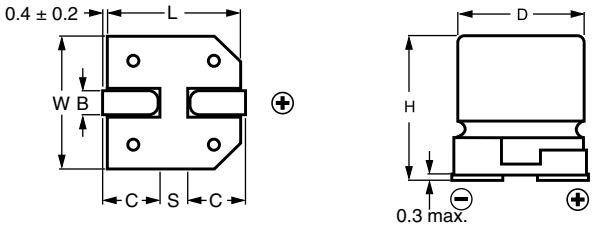

Fig.2 Dimensional outline

Table 2

TAPE AND REEL DIMENSIONS in millimeters, PACKAGING QUANTITIES						
NOMINAL CASE SIZE L x W x H	CASE CODE	PITCH P_1	TAPE WIDTH W	TAPE THICKNESS T_2	REEL DIA.	PACKAGING QUANTITY PER REEL
8 x 8 x 10	0810	16	24	11.3	380	500
10 x 10 x 10	1010	16	24	11.3	380	500
10 x 10 x 14	1014	16	24	14.8	330	250

Note
1. Detailed tape dimensions see section “PACKAGING”.

MOUNTING

The capacitors are designed for automatic placement on to printed-circuit boards.

Optimum dimensions of soldering pads depend amongst others on soldering method, mounting accuracy, print layout and/or adjacent components.

For recommended soldering pad dimensions, refer to Fig.3 and Table 3.

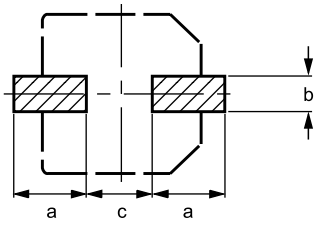

Fig.3 Recommended solder pad dimensions

SOLDERING

Soldering conditions are defined by the curve, temperature versus time, where the temperature is that measured on the soldering pad during processing.

For maximum conditions refer to Fig.4.

Any temperature versus time curve which does not exceed the specified maximum curves may be applied.

AS A GENERAL PRINCIPLE, TEMPERATURE AND DURATION SHALL BE THE **MINIMUM** NECESSARY REQUIRED TO ENSURE GOOD SOLDERING CONNECTIONS. HOWEVER, THE SPECIFIED MAXIMUM CURVES SHOULD NEVER BE EXCEEDED.

Table 3

RECOMMENDED SOLDERING PAD DIMENSIONS in millimeters			
CASE CODE	a	b	c
0810	3.5	2.5	3.0
1010	4.3	2.5	4.0
1014	4.3	2.5	4.0

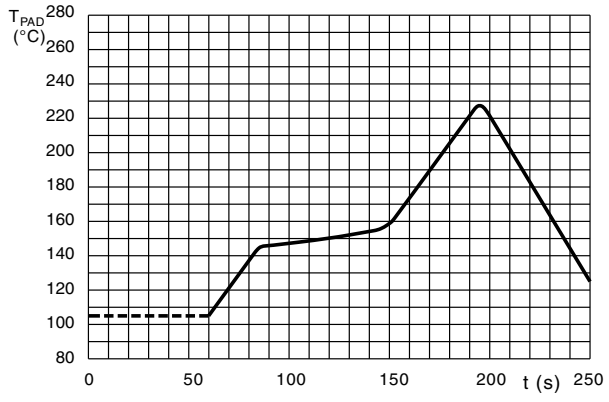

Fig.4 Maximum temperature load during infrared reflow soldering measured on the soldering pad

For technical questions, contact: aluminumcaps1@vishay.com

ELECTRICAL DATA	
SYMBOL	DESCRIPTION
C_R	rated capacitance at 100 Hz, tolerance ± 20 %
I_R	rated RMS ripple current at 100 kHz, 105 °C
I_{l2}	max. leakage current after 2 minutes at U_R
tan δ	max. dissipation factor at 100 Hz
Z	max. impedance at 100 kHz

Note

Unless otherwise specified, all electrical values in Table 4 apply at T_{amb} = 20 °C, P = 86 kPa to 106 kPa, RH = 45 % to 75 %.

ORDERING EXAMPLE

Electrolytic capacitor 150 CLZ series

220 µF/50 V; ± 20 %

Nominal case size: 10 mm x 10 mm x 14 mm; taped on reel

Ordering code: MAL215095102E3
Former 12NC: 2222 150 95102

Table 4

ELECTRICAL DATA AND ORDERING INFORMATION							
U_R (V)	C_R (µF)	NOMINAL CASE SIZE L x W x H (mm)	I_R 105 °C 100 kHz (mA)	I_{L2} 2 min (mA)	tan δ 100 Hz	Z 100 kHz (Ω)	ORDERING CODE MAL2150.....
6.3	470	8 x 8 x 10	435	30	0.24	0.25	95311E3
	1000	10 x 10 x 10	670	63	0.24	0.13	95301E3
10	330	8 x 8 x 10	435	33	0.20	0.25	95411E3
	470	8 x 8 x 10	435	47	0.20	0.25	95412E3
	680	10 x 10 x 10	670	68	0.20	0.13	95401E3
	1000	10 x 10 x 14	850	100	0.20	0.10	95402E3
16	220	8 x 8 x 10	435	35	0.16	0.25	95511E3
	330	8 x 8 x 10	435	53	0.16	0.25	95512E3
	470	10 x 10 x 10	670	75	0.16	0.13	95501E3
	680	10 x 10 x 14	850	109	0.16	0.10	95502E3
25	150	8 x 8 x 10	420	38	0.14	0.28	95611E3
	220	8 x 8 x 10	420	55	0.14	0.28	95612E3
	330	10 x 10 x 10	640	83	0.14	0.14	95601E3
	470	10 x 10 x 14	820	118	0.14	0.11	95602E3
35	100	8 x 8 x 10	405	35	0.12	0.30	95011E3
	220	10 x 10 x 10	630	77	0.12	0.15	95001E3
	330	10 x 10 x 14	790	116	0.12	0.12	95002E3
50	68	8 x 8 x 10	333	34	0.12	0.48	95111E3
	100	10 x 10 x 10	490	50	0.12	0.24	95101E3
	220	10 x 10 x 14	620	110	0.12	0.19	95102E3
63	33	8 x 8 x 10	270	21	0.10	0.65	95812E3
	47	8 x 8 x 10	270	30	0.10	0.65	95811E3
	47	10 x 10 x 10	390	30	0.10	0.38	95801E3
	68	10 x 10 x 10	390	43	0.10	0.38	95802E3
	100	10 x 10 x 14	507	63	0.10	0.29	95803E3

ADDITIONAL ELECTRICAL DATA		
PARAMETER	**CONDITIONS**	**VALUE**
VOLTAGE		
Surge voltage for short periods	IEC 60384-18, subclause 4.14	$U_s \leq 1.15 \times U_R$
Reverse voltage for short periods	IEC 60384-18, subclause 4.16	$U_{rev} \leq 1$ V
CURRENT		
Leakage current	after 2 minutes at U_R	$I_{L2} \leq 0.01 \times C_R \times U_R$
INDUCTANCE		
Equivalent series inductance (ESL)		typ. 16 nH
RESISTANCE		
Equivalent series resistance (ESR) at 100 Hz	calculated from tan δ_{max} and C_R (see Table 4)	ESR = tan δ/2 πf C_R

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CAPACITANCE (C)

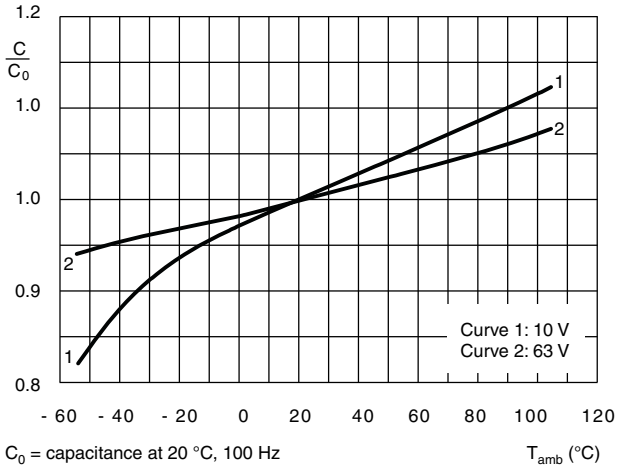


Fig.5 Typical multiplier of capacitance as a function of ambient temperatures

DISSIPATION FACTOR (tan δ)

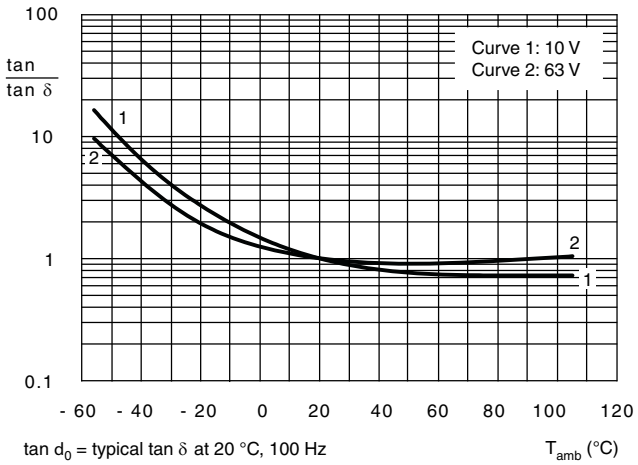


Fig.6 Typical multiplier of dissipation factor (tan d) as a function of ambient temperatures

EQUIVALENT SERIES RESISTANCE (ESR)

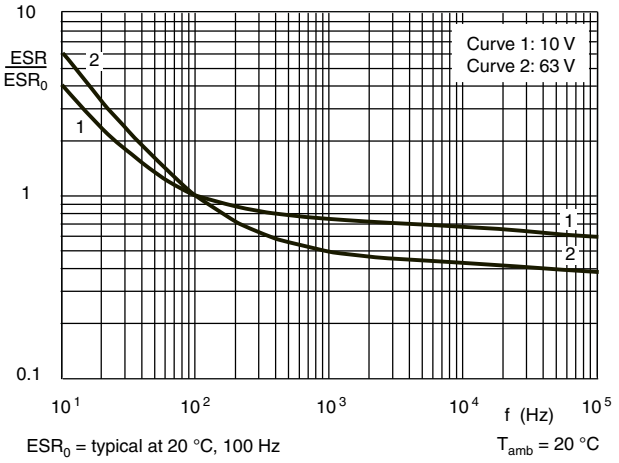


Fig.7 Typical multiplier of ESR as a function of frequency

IMPEDANCE (Z)

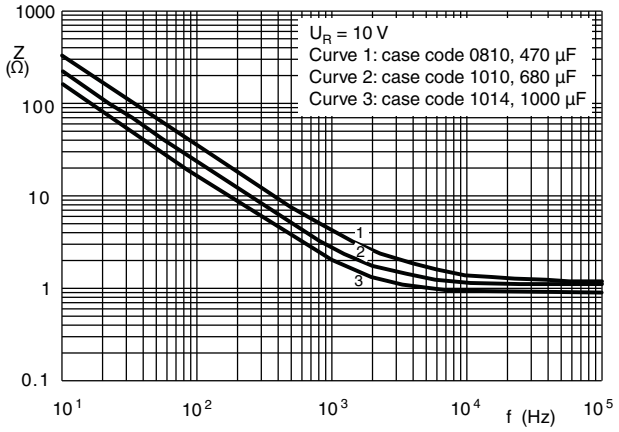


Fig.8 Typical impedance as a function of frequency

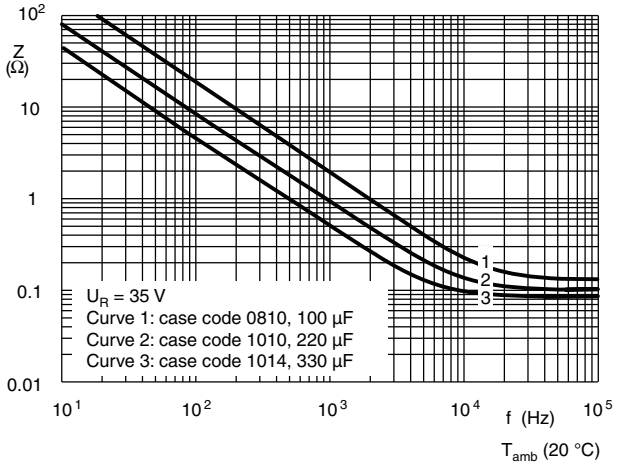


Fig.9 Typical impedance as a function of frequency

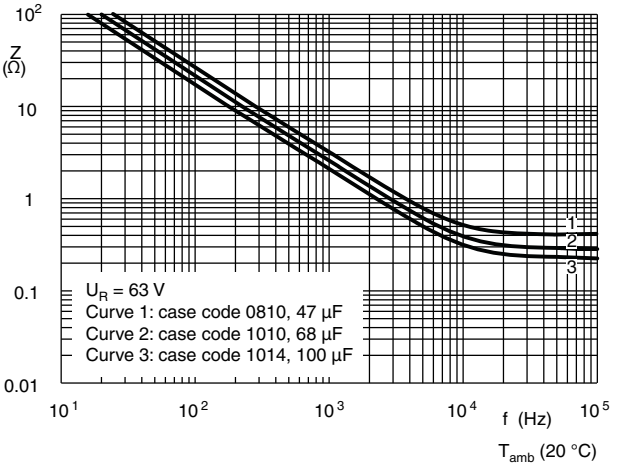
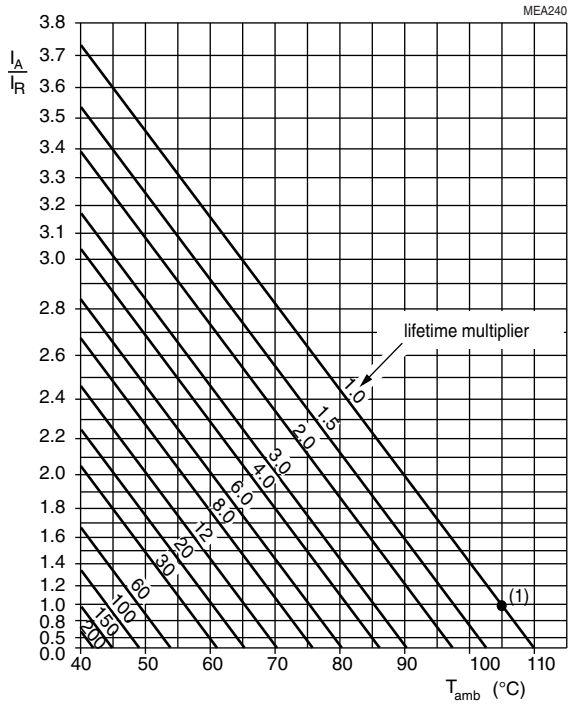


Fig.10 Typical impedance as a function of frequency

RIPPLE CURRENT AND USEFUL LIFE



I_A = actual ripple current at 100 kHz
I_R = rated ripple current at 100 kHz, 105 °C
(1) = useful life at 105 °C and I_R applied:
case code ≤ 1010 : 2500 h
case code = 1014 : 3000 h

Fig.11 Multiplier of useful life as a function of ambient temperature and ripple current load

MULTIPLIER OF RIPPLE CURRENT (I_R) AS A FUNCTION OF FREQUENCY			
FREQUENCY (Hz)	I_R MULTIPLIER		
	U_R = 6.3 V to 25 V	U_R = 35 V	U_R = 50 V to 63 V
100	0.70	0.65	0.60
300	0.80	0.80	0.75
1000	0.85	0.85	0.85
3000	0.93	0.93	0.93
10 000	0.95	0.95	0.95
30 000	0.97	0.97	0.97
100 000	1.00	1.00	1.00

TEST PROCEDURES AND REQUIREMENTS			
TEST		**PROCEDURE**	**REQUIREMENTS**
NAME OF TEST	**REFERENCE**	**(quick reference)**	
Mounting	IEC 60384-18, subclause 4.3	shall be performed prior to tests mentioned below; reflow soldering; for maximum temperature load refer to chapter “Mounting”	ΔC/C: ± 5 % tan δ ≤ spec. limit I_{L2} ≤ spec. limit
Endurance	IEC 60384-18/ CECC 32300, subclause 4.15	T_{amb} = 105 °C; U_R applied; 2000 hours	U_R = 6.3 V; ΔC/C: ± 25 % U_R ≥ 10 V; ΔC/C: ± 20 % tan δ ≤ 2 x spec. limit I_{L2} ≤ spec. limit
Useful life	CECC 30301, subclause 1.8.1	T_{amb} = 105 °C; U_R and I_R applied; case size ≤ 10 x 10 x 10: 2500 hours case size = 10 x 10 x 14: 3000 hours,	ΔC/C: ± 50 % tan δ ≤ 3 x spec. limit I_{L2} ≤ spec. limit no short or open circuit total failure percentage: ≤ 1 %
Shelf life (storage at high temperature)	IEC 60384-18/ CECC 32300, subclause 4.17	T_{amb} = 105 °C; no voltage applied; 1000 hours after test: U_R to be applied for 30 minutes, 24 hours to 48 hours before measurement	for requirements see ‘Endurance test’ above

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