Conductive Polymer Aluminum Capacitors SMD (Chip), Low Impedance



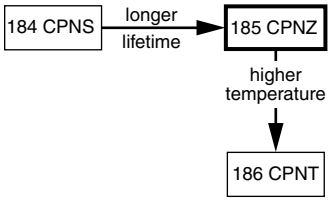


Fig. 1

QUICK REFERENCE DATA	
DESCRIPTION	**VALUE**
Nominal case sizes (L x W x H in mm)	6.3 x 6.3 x 5.8 to 10.0 x 10.0 x 12.4
Rated capacitance range, C_R	10 µF to 1500 µF
Tolerance on C_R	± 20 %
Rated voltage range, U_R	6.3 V to 50 V
Category temperature range	-55 °C to +105 °C
Endurance test at 105 °C	5000 h
Useful life at 105 °C	5000 h
Shelf life at 0 V, 105 °C	1000 h
Based on sectional specification	IEC 60384-25 / CECC 32300
Climatic category IEC 60068	55 / 105 / 56

FEATURES

Pb-free RoHS COMPLIANT

- Extended useful life: up to 5000 h at 105 °C
- Very low ESR and high ripple current
- Voltages up to 50 V
- SMD-version with base plate, lead (Pb)-free reflow solderable
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

APPLICATIONS

- Industrial and professional applications
- Telecommunications and IT
- Portable and mobile equipment

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 beveled edges)
- Code indicating group number (85)

PACKAGING

Supplied in blister tape on reel

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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	20	25	35	50
10	→	→	→	→	→	6.3 x 6.3 x 5.8	8.0 x 8.0 x 7.7
22	→	→	→	→	6.3 x 6.3 x 5.8	→	8.0 x 8.0 x 8.7 10.0 x 10.0 x 8.7
27	→	→	→	→	→	6.3 x 6.3 x 7.7	8.0 x 8.0 x 11.7
33	→	→	→	6.3 x 6.3 x 5.8	→	→	10.0 x 10.0 x 10.5
39	→	→	→	→	→	8.0 x 8.0 x 8.7	-
47	→	→	6.3 x 6.3 x 5.8	→	6.3 x 6.3 x 7.7 8.0 x 8.0 x 11.7	-	-
56	→	6.3 x 6.3 x 5.8	→	→	→	8.0 x 8.0 x 11.7	-
68	→	→	→	6.3 x 6.3 x 7.7	8.0 x 8.0 x 7.7 8.0 x 8.0 x 11.7	→	10.0 x 10.0 x 12.4
82	→	→	→	→	10.0 x 10.0 x 8.7	-	-
100	6.3 x 6.3 x 5.8	→	→	→	6.3 x 6.3 x 7.7 8.0 x 8.0 x 8.7	10.0 x 10.0 x 12.4	10.0 x 10.0 x 12.4
120	→	→	6.3 x 6.3 x 7.7 8.0 x 8.0 x 7.7	8.0 x 8.0 x 7.7	10.0 x 10.0 x 10.5	-	-
150	→	→	8.0 x 8.0 x 7.7 10.0 x 10.0 x 8.7	→	→	10.0 x 10.0 x 10.5 10.0 x 10.0 x 12.4	-
180	→	6.3 x 6.3 x 7.7	8.0 x 8.0 x 7.7 10.0 x 10.0 x 8.7	8.0 x 8.0 x 11.7	10.0 x 10.0 x 12.4	-	-
220	6.3 x 6.3 x 5.8	→	8.0 x 8.0 x 7.7	10.0 x 10.0 x 10.5	8.0 x 8.0 x 11.7 10.0 x 10.0 x 12.4	-	-
270	6.3 x 6.3 x 7.7	8.0 x 8.0 x 7.7	-	-	-	-	-
330	→	10.0 x 10.0 x 8.7	10.0 x 10.0 x 10.5	10.0 x 10.0 x 12.4	-	-	-
470	8.0 x 8.0 x 7.7	8.0 x 8.0 x 11.7	-	-	-	-	-
560	→	10.0 x 10.0 x 10.5	-	-	-	-	-
680	→	→	10.0 x 10.0 x 12.4	-	-	-	-
820	8.0 x 8.0 x 11.7	-	-	-	-	-	-
1000	10.0 x 10.0 x 10.5	10.0 x 10.0 x 12.4	-	-	-	-	-
1500	10.0 x 10.0 x 12.4	-	-	-	-	-	-

2-pin:

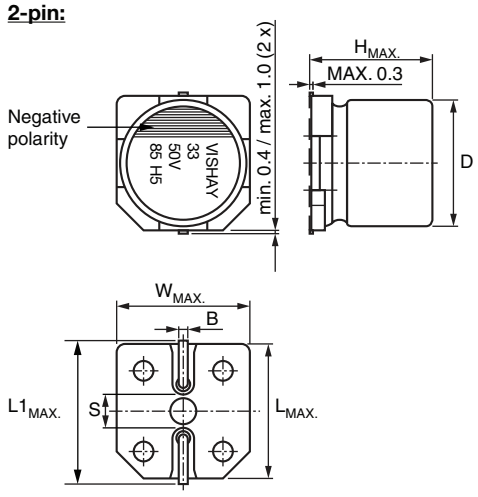


Fig. 2 - Dimensional outline

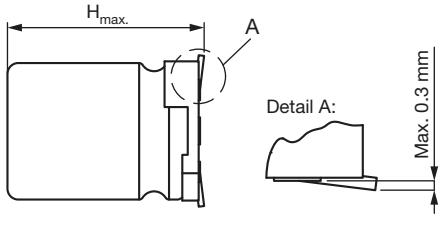


Fig. 3 - Coplanarity of pins

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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**	**$L1_{MAX.}$**	**MASS (g)**
6.3 x 6.3 x 5.8	0606	6.8	6.8	6.1	6.3	0.8	2.2	7.4	0.3
6.3 x 6.3 x 7.7	0608	6.8	6.8	8.0	6.3	0.8	2.2	7.4	0.4
8.0 x 8.0 x 7.7	0808	8.5	8.5	8.0	8.0	1.1	3.1	9.2	0.6
8.0 x 8.0 x 8.7	0809	8.5	8.5	9.0	8.0	1.1	3.1	9.2	0.7
8.0 x 8.0 x 11.7	0812	8.5	8.5	12.0	8.0	1.1	3.1	9.2	0.8
10.0 x 10.0 x 8.7	1009	10.5	10.5	9.0	10.0	1.1	4.5	11.2	1.0
10.0 x 10.0 x 10.5	1010	10.5	10.5	10.8	10.0	1.1	4.5	11.2	1.3
10.0 x 10.0 x 12.4	1012	10.5	10.5	12.7	10.0	1.1	4.5	11.2	1.4

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 DIAMETER**	**PACKAGING QUANTITY PER REEL**
6.3 x 6.3 x 5.8	0606	12	16	6.2	380	1000
6.3 x 6.3 x 7.7	0608	12	16	8.0	380	900
8.0 x 8.0 x 7.7	0808	12	16	8.2	380	700
8.0 x 8.0 x 8.7	0809	16	24	11.0	380	500
8.0 x 8.0 x 11.7	0812	16	24	13.0	380	400
10.0 x 10.0 x 8.7	1009	16	24	11.0	380	500
10.0 x 10.0 x 10.5	1010	16	24	11.0	380	500
10.0 x 10.0 x 12.4	1012	16	24	12.9	380	400

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. 4 and Table 3.

SOLDERING

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

For maximum conditions refer to Fig. 5.

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.

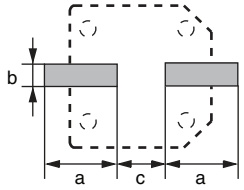


Fig. 4 - Recommended soldering pad dimensions

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Table 3

RECOMMENDED SOLDERING PAD DIMENSIONS in millimeters				
NOMINAL CASE SIZE L x W x H	**CASE CODE**	**a**	**b**	**c**
6.3 x 6.3 x 5.8	0606	3.5	1.6	2.1
6.3 x 6.3 x 7.7	0608	3.5	1.6	2.1
8.0 x 8.0 x 7.7	0808	4.2	1.9	2.8
8.0 x 8.0 x 8.7	0809	4.2	1.9	2.8
8.0 x 8.0 x 11.7	0812	4.2	1.9	2.8
10.0 x 10.0 x 8.7	1009	4.4	1.9	4.3
10.0 x 10.0 x 10.5	1010	4.4	1.9	4.3
10.0 x 10.0 x 12.4	1012	4.4	1.9	4.3

SOLDERING PROFILE FOR LEAD (Pb)-FREE REFLOW PROCESS

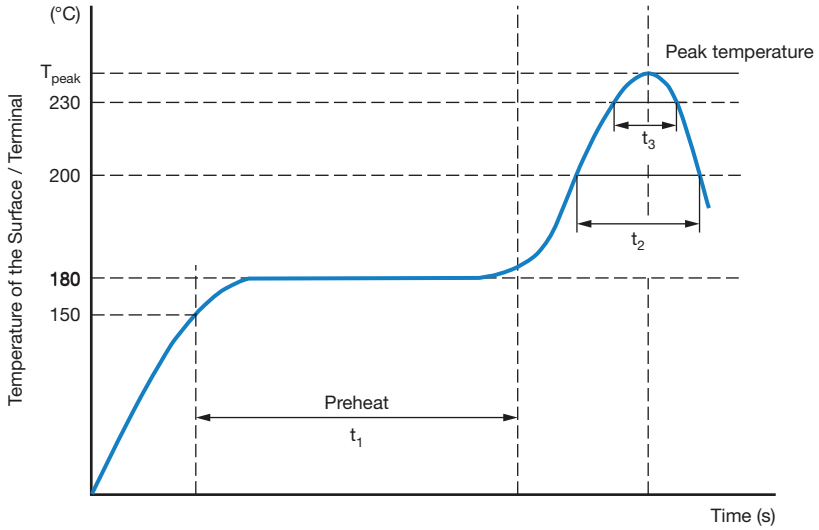


Fig. 5 - Maximum temperature load during reflow soldering

Table 4

REFLOW SOLDERING CONDITIONS for MAL2185xxxxxE3					
PROFILE FEATURES	**2.5 V TO 10 V**		**16 V TO 25 V**		**35 V TO 100 V**
Maximum time between 150 °C to 180 °C (t_1)	120 s		120 s		120 s
Ramp up rate from 217 °C to T_{peak}	0.5 K/s to 3 K/s				
Maximum time above 200 °C (t_2)	90 s		90 s	80 s	70 s
Maximum time above 230 °C (t_3)	60 s		60 s	50 s	30 s
Peak temperature T_{Peak}	260 °C	250 °C	250 °C	240 °C	240 °C
Maximum reflow cycles	1	2	1	2	1
Ramp down rate T_{peak} to 217 °C	6 K/s max.				
Time 25 °C to T_{Peak}	8 min max.				

Note

- Temperature measuring point on top of the case and on terminals

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ELECTRICAL DATA	
SYMBOL	DESCRIPTION
C_R	Rated capacitance at 120 Hz, tolerance ± 20 %
I_R 105 °C	Max. allowed ripple current at 100 kHz
I_{L2}	Max. leakage current after 2 min at U_R
tan δ	Max. dissipation factor at 120 Hz
ESR	Max. ESR at 100 kHz

Note

- Unless otherwise specified, all electrical values in Table 5 apply at T_{amb} = 20 °C, P = 86 kPa to 106 kPa, RH = 45 % to 75 %

ORDERING EXAMPLE

Conductive polymer 185 CPNZ series

120 µF / 16 V; ± 20 %

Nominal case size: 6.3 mm x 6.3 mm x 7.7 mm; taped on reel

Ordering code: MAL218597502E3

Table 5

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 (µA)	tan δ 120 Hz	ESR 100 kHz 20 °C (mΩ)	ORDERING CODE MAL2185...
6.3	100	6.3 x 6.3 x 5.8	2300	300	0.08	32	97301E3
	220	6.3 x 6.3 x 5.8	2800	300	0.08	20	97302E3
	270	6.3 x 6.3 x 7.7	3000	340	0.08	22	97303E3
	470	8.0 x 8.0 x 7.7	3700	592	0.08	22	97304E3
	820	8.0 x 8.0 x 11.7	5000	1033	0.08	12	97305E3
	1000	10.0 x 10.0 x 10.5	4700	1260	0.08	15	97306E3
	1500	10.0 x 10.0 x 12.4	5300	1890	0.08	12	97307E3
10	56	6.3 x 6.3 x 5.8	2300	300	0.08	32	97401E3
	180	6.3 x 6.3 x 7.7	2900	360	0.08	22	97402E3
	270	8.0 x 8.0 x 7.7	3200	540	0.08	22	97403E3
	330	10.0 x 10.0 x 8.7	3700	660	0.08	22	97404E3
	470	8.0 x 8.0 x 11.7	4500	940	0.08	12	97405E3
	560	10.0 x 10.0 x 10.5	4200	1120	0.08	15	97406E3
	1000	10.0 x 10.0 x 12.4	4800	2000	0.08	12	97407E3
16	47	6.3 x 6.3 x 5.8	1700	400	0.10	48	97501E3
	120	6.3 x 6.3 x 7.7	2400	400	0.12	28	97502E3
	120	8.0 x 8.0 x 7.7	3000	400	0.12	28	97503E3
	150	8.0 x 8.0 x 8.7	3100	480	0.12	26	97504E3
	150	10.0 x 10.0 x 8.7	3100	480	0.12	33	97505E3
	180	8.0 x 8.0 x 11.7	4200	576	0.12	18	97506E3
	180	10.0 x 10.0 x 8.7	3100	576	0.12	33	97507E3
	220	8.0 x 8.0 x 11.7	4200	704	0.12	18	97508E3
	330	10.0 x 10.0 x 10.5	3800	1056	0.12	23	97509E3
	680	10.0 x 10.0 x 12.4	4500	2176	0.12	18	97511E3
20	33	6.3 x 6.3 x 5.8	1700	600	0.10	48	97551E3
	68	6.3 x 6.3 x 7.7	2300	600	0.10	33	97552E3
	120	8.0 x 8.0 x 7.7	2900	600	0.12	33	97553E3
	180	8.0 x 8.0 x 11.7	4000	720	0.12	23	97554E3
	220	10.0 x 10.0 x 10.5	3650	880	0.12	25	97555E3
	330	10.0 x 10.0 x 12.4	4200	1320	0.12	23	97556E3

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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 (µA)	tan δ 120 Hz	ESR 100 kHz 20 °C (mΩ)	ORDERING CODE MAL2185...
25	22	6.3 x 6.3 x 5.8	1600	600	0.10	58	97601E3
	47	6.3 x 6.3 x 7.7	2300	600	0.10	33	97602E3
	47	8.0 x 8.0 x 11.7	3700	600	0.12	23	97603E3
	68	8.0 x 8.0 x 7.7	2900	600	0.12	33	97604E3
	68	8.0 x 8.0 x 11.7	4000	600	0.12	23	97605E3
	82	10.0 x 10.0 x 8.7	2900	600	0.12	33	97606E3
	100	6.3 x 6.3 x 7.7	2000	600	0.12	40	97607E3
	100	8.0 x 8.0 x 8.7	3200	600	0.12	27	97608E3
	120	10.0 x 10.0 x 10.5	3650	600	0.12	25	97609E3
	180	10.0 x 10.0 x 12.4	4200	900	0.12	23	97611E3
	220	8.0 x 8.0 x 11.7	4000	1100	0.12	23	97612E3
	220	10.0 x 10.0 x 12.4	4200	1100	0.12	23	97613E3
35	10	6.3 x 6.3 x 5.8	980	600	0.12	75	97001E3
	27	6.3 x 6.3 x 7.7	1400	600	0.12	60	97002E3
	39	8.0 x 8.0 x 8.7	1800	600	0.12	40	97003E3
	56	8.0 x 8.0 x 11.7	2300	600	0.12	35	97004E3
	100	10.0 x 10.0 x 12.4	3100	700	0.12	30	97005E3
	150	10.0 x 10.0 x 10.5	2500	700	0.12	32	97006E3
	150	10.0 x 10.0 x 12.4	3100	700	0.12	30	97007E3
50	10	8.0 x 8.0 x 7.7	1400	100	0.12	75	97101E3
	22	8.0 x 8.0 x 8.7	1800	220	0.12	50	97102E3
	22	10.0 x 10.0 x 8.7	1800	220	0.12	55	97103E3
	27	8.0 x 8.0 x 11.7	2400	270	0.12	40	97104E3
	33	10.0 x 10.0 x 10.5	2200	330	0.12	42	97105E3
	68	10.0 x 10.0 x 12.4	3000	680	0.12	30	97106E3
	100	10.0 x 10.0 x 12.4	3650	1000	0.12	26	97107E3

Table 6

ADDITIONAL ELECTRICAL DATA		
PARAMETER	**CONDITIONS**	**VALUE**
Voltage		
Surge voltage for short periods	IEC 60384-25, subclause 4.14	$U_s \leq 1.15 \times U_R$

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USEFUL LIFE AND ENDURANCE

Table 7

ENDURANCE TEST AND USEFUL LIFE							
SERIES	CASE CODE	USEFUL LIFE AT 105 °C (h) (1)	ENDURANCE AT 105 °C (h)	ENDURANCE AT 95 °C (h)	ENDURANCE AT 85 °C (h)	ENDURANCE AT 75 °C (h)	ENDURANCE AT 65 °C (h)
185 CPNZ	0606 to 1012	5000	5000	15 000	50 000	150 000	500 000

Note

(1) Identical with endurance for this series

Endurance can be calculated by formula below:

$$L = L_{Tmax.} \times 10^{\frac{T_{max.} - T_a}{20}}$$

L: estimated lifetime (h)

$L_{Tmax.}$: base lifetime specified at maximum operating temperature with applied DC voltage (h)

$T_{max.}$: rated maximum operating temperature (°C)

T_a: actual ambient temperature (°C)

Table 8

MULTIPLIER OF RIPPLE CURRENT (I_R) AS A FUNCTION OF FREQUENCY			
FREQUENCY (Hz)			
120	1000	10 000	≥ 100 000
I_R MULTIPLIER			
0.05	0.3	0.7	1

Table 9

TEST PROCEDURES AND REQUIREMENTS			
TEST		PROCEDURE (quick reference)	REQUIREMENTS
NAME OF TEST	REFERENCE		
Mounting	IEC 60384-25, 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 60384-25 / CECC 32300, subclause 4.15	T_{amb} = 105 °C; U_R applied; for test duration see Table 7	ΔC/C: ± 20 % tan δ ≤ 1.5 x spec. limit I_{L2} ≤ spec. limit ESR ≤ 1.5 x spec. limit
Useful life	CECC 30301, subclause 1.8.1	T_{amb} = 105 °C; U_R and I_R applied; for test duration see Table 7	ΔC/C: ± 20 % tan δ ≤ 1.5 x spec. limit I_{L2} ≤ spec. limit ESR ≤ 1.5 x spec. limit
Shelf life (storage at high temperature)	IEC 60384-25 / CECC 32300, subclause 4.16	T_{amb} = 105 °C; no voltage applied; 1000 h after test: U_R to be applied for 30 min, 24 h to 48 h before measurement	For requirements see “Endurance test” above

Statements about product lifetime are based on calculations and internal testing. They should only be interpreted as estimations. Also due to external factors, the lifetime in the field application may deviate from the calculated lifetime. In general, nothing stated herein shall be construed as a guarantee of durability.

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