Conductive Polymer Aluminum Capacitors SMD (Chip), Low Impedance

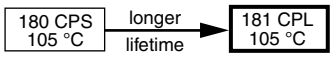

Fig. 1

QUICK REFERENCE DATA	
DESCRIPTION	**VALUE**
Nominal case sizes (L x W x H in mm)	6.6 x 6.6 x 5.9 to 10.4 x 10.4 x 12.6
Rated capacitance range, C_R	18 µF to 820 µF
Tolerance on C_R	± 20 %
Rated voltage range, U_R	4.0 V to 35 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 60384-18 / CECC 32300
Climatic category IEC 60068	55/105/56

FEATURES

Pb-free

RoHS COMPLIANT

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

APPLICATIONS

- SMD technology, for high temperature reflow soldering
- 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
- Blue mark or “-” sign indicating the cathode (the anode is identified by bevelled edges)
- Code indicating group number (L)

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)						
	4.0	6.3	10	16	20	25	35
18	→	→	→	→	→	→	6.6 x 6.6 x 5.9
39	→	→	→	6.6 x 6.6 x 5.9	-	-	-
47	→	→	→	→	→	6.6 x 6.6 x 5.9	-
56	→	→	6.6 x 6.6 x 5.9	→	6.6 x 6.6 x 5.9	-	-
68	→	→	6.6 x 6.6 x 5.9	6.6 x 6.6 x 5.9	-	-	-
82	→	→	→	8.4 x 8.4 x 6.7	→	→	8.4 x 8.4 x 12
100	→	6.6 x 6.6 x 5.9	→	10.4 x 10.4 x 7.7	-	-	-
120	→	6.6 x 6.6 x 5.9	6.6 x 6.6 x 5.9	8.4 x 8.4 x 6.7	-	-	-
150	6.6 x 6.6 x 5.9	→	8.4 x 8.4 x 6.7 10.4 x 10.4 x 7.7	8.4 x 8.4 x 6.7	→	8.4 x 8.4 x 12	10.4 x 10.4 x 12.6
180	→	→	→	10.4 x 10.4 x 7.7	-	-	-
220	→	6.6 x 6.6 x 5.9 8.4 x 8.4 x 6.7	-	-	-	-	-
270	8.4 x 8.4 x 6.7	→	8.4 x 8.4 x 6.7	→	8.4 x 8.4 x 12	10.4 x 10.4 x 12.6	-
330	6.6 x 6.6 x 5.9 8.4 x 8.4 x 6.7	→	10.4 x 10.4 x 7.7	-	-	-	-
390	→	8.4 x 8.4 x 6.7	→	→	8.4 x 8.4 x 12	-	-
470	→	10.4 x 10.4 x 7.7	→	→	10.4 x 10.4 x 12.6	-	-
560	8.4 x 8.4 x 6.7	-	-	-	-	-	-
680	10.4 x 10.4 x 7.7	-	-	-	-	-	-
820	→	→	→	10.4 x 10.4 x 12.6	-	-	-

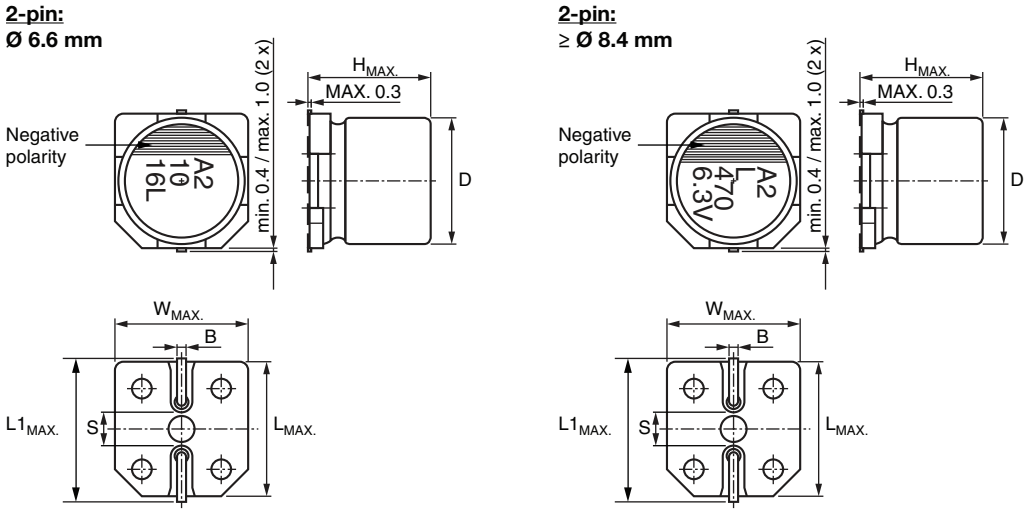

Fig. 2 - Dimensional outline

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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)**
6.6 x 6.6 x 5.9	0606	6.8	6.8	6	6.3	0.8	2.0	7.4	~ 0.25
8.4 x 8.4 x 6.7	0807	8.6	8.6	7	8	1.1	3.1	9.2	~ 0.5
8.4 x 8.4 x 12	0812	8.6	8.6	12.5	8	1.1	3.1	9.2	~ 0.8
10.4 x 10.4 x 7.7	1008	10.6	10.6	8	10	1.3	4.7	11.2	~ 0.9
10.4 x 10.4 x 12.6	1013	10.6	10.6	12.7	10	1.3	4.7	11.2	~ 1.3

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**
6.6 x 6.6 x 5.9	0606	12	16	6.2	380	1000
8.4 x 8.4 x 6.7	0807	12	16	6.8	380	1000
8.4 x 8.4 x 12	0812	16	16	13.0	380	400
10.4 x 10.4 x 7.7	1008	16	24	10.0	380	500
10.4 x 10.4 x 12.6	1013	16	24	14.0	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. 3 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. 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.

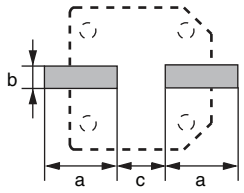

Fig. 3 - Recommended soldering pad dimensions

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Table 3

RECOMMENDED SOLDERING PAD DIMENSIONS in millimeters			
CASE CODE	**a**	**b**	**c**
0606	1.9	3.5	1.6
0807	3.0	3.5	2.5
0812	3.0	3.5	2.5
1008	4.0	4.0	2.5
1013	4.0	4.0	2.5

ADVANCED SOLDERING PROFILE FOR LEAD (Pb)-FREE REFLOW PROCESS

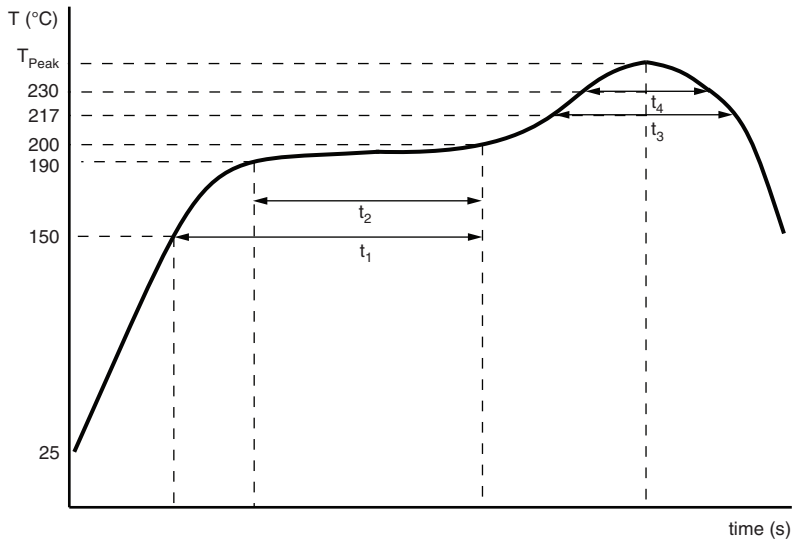

Fig. 4 - Maximum temperature load during reflow soldering

Table 4

REFLOW SOLDERING CONDITIONS for MAL2181xxxxxE3	
PROFILE FEATURES	**CASE CODE 0606 TO 1013**
Max. time from 25 °C to T_{Peak}	300 s
Max. ramp-up rate to 150 °C	3 K/s
Max. time from 150 °C to 200 °C (t_1)	150 s
Max. time from 190 °C to 200 °C (t_2)	110 s
Ramp up rate from 200 °C to T_{Peak}	0.5 K/s to 3 K/s
Max. time above $T_{Liquidus}$ (217 °C) (t_3)	90 s
Max. time above 230 °C (t_4)	70 s
Peak temperature T_{Peak}	260 °C
Max. time above T_{Peak} minus 5 °C	40 s
Ramp-down rate from $T_{Liquidus}$	3 K/s to 6 K/s

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 100 Hz, tolerance ± 20 %
I_R	Rated RMS ripple current at 100 kHz, 105 °C
I_{L2}	Max. leakage current after 2 min 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 5 apply at T_{amb} = 20 °C, P = 86 kPa to 106 kPa, RH = 45 % to 75 %

ORDERING EXAMPLE

Conductive polymer 181 CPL series

100 µF / 16 V; ± 20 %

Nominal case size: 10.4 mm x 10.4 mm x 7.7 mm; taped on reel

Ordering code: MAL218197504E3

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 100 Hz	Z 100 kHz 20 °C (Ω)	ORDERING CODE MAL2181...
4.0	150	6.6 x 6.6 x 5.9	2570	120	0.12	0.022	97701E3
	270	8.4 x 8.4 x 6.7	3220	216	0.12	0.022	97702E3
	330	6.6 x 6.6 x 5.9	2800	264	0.12	0.020	97703E3
	330	8.4 x 8.4 x 6.7	3220	264	0.12	0.022	97704E3
	560	8.4 x 8.4 x 6.7	3600	448	0.12	0.018	97705E3
	680	10.4 x 10.4 x 7.7	4130	544	0.12	0.020	97706E3
6.3	100	6.6 x 6.6 x 5.9	2800	126	0.12	0.022	97301E3
	120	6.6 x 6.6 x 5.9	2800	151	0.12	0.022	97302E3
	220	6.6 x 6.6 x 5.9	2800	277	0.12	0.020	97303E3
	220	8.4 x 8.4 x 6.7	3220	277	0.12	0.022	97306E3
	390	8.4 x 8.4 x 6.7	3220	491	0.12	0.022	97307E3
	470	10.4 x 10.4 x 7.7	4130	592	0.12	0.020	97308E3
10	56	6.6 x 6.6 x 5.9	2300	112	0.12	0.027	97401E3
	68	6.6 x 6.6 x 5.9	2300	136	0.12	0.027	97402E3
	120	6.6 x 6.6 x 5.9	2300	240	0.12	0.027	97403E3
	150	8.4 x 8.4 x 6.7	2760	300	0.12	0.030	97404E3
	150	10.4 x 10.4 x 7.7	3020	300	0.12	0.030	97405E3
	270	8.4 x 8.4 x 6.7	3200	540	0.12	0.022	97406E3
	330	10.4 x 10.4 x 7.7	3770	660	0.12	0.024	97407E3
16	39	6.6 x 6.6 x 5.9	2200	125	0.12	0.030	97501E3
	68	6.6 x 6.6 x 5.9	2200	218	0.12	0.030	97502E3
	82	8.4 x 8.4 x 6.7	2800	262	0.12	0.028	97503E3
	100	10.4 x 10.4 x 7.7	2670	320	0.12	0.035	97504E3
	120	8.4 x 8.4 x 6.7	2800	384	0.12	0.028	97505E3
	180	10.4 x 10.4 x 7.7	3430	576	0.12	0.029	97506E3
	820	10.4 x 10.4 x 12.6	5400	2624	0.12	0.012	97507E3
20	56	6.6 x 6.6 x 5.9	1300	224	0.12	0.048	97201E3
	270	8.4 x 8.4 x 12	4000	1080	0.12	0.021	97202E3
	390	8.4 x 8.4 x 12	4950	1560	0.12	0.014	97203E3
	470	10.4 x 10.4 x 12.6	4300	1880	0.12	0.020	97204E3
25	47	6.6 x 6.6 x 5.9	1300	235	0.12	0.049	97601E3
	150	8.4 x 8.4 x 12	2200	750	0.12	0.028	97602E3
	270	10.4 x 10.4 x 12.6	2700	1350	0.12	0.027	97603E3
35	18	6.6 x 6.6 x 5.9	900	126	0.12	0.064	97001E3
	82	8.4 x 8.4 x 12	2200	574	0.12	0.029	97002E3
	150	10.4 x 10.4 x 12.6	2600	1050	0.12	0.028	97003E3

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Table 6

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; $T_A \leq 105$ °C	$U_{rev} \leq 1$ V

USEFUL LIFE AND ENDURANCE

Table 7

ENDURANCE TEST AND USEFUL LIFE				
SERIES	**CASE CODE**	**USEFUL LIFE AT 105 °C (h)**	**ENDURANCE AT 105 °C (h)**	**ENDURANCE AT 85 °C (h)**
181 CPL	0606 to 1013	5000	5000	50 000

Endurance can be calculated by formula below:

$$L_r = L_0 \times 10^{\frac{T_0 - T_r}{20}}$$

L_r: estimated lifetime (h)

L_0: base lifetime specified at maximum operating temperature with applied the DC voltage (h)

T_0: rated maximum operating temperature (°C)

T_r: actual ambient temperature (°C)

Table 8

TEST PROCEDURES AND REQUIREMENTS			
TEST		**PROCEDURE (quick reference)**	**REQUIREMENTS**
NAME OF TEST	**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”	$\Delta C/C$: ± 5 % tan $\delta \leq$ spec. limit $I_{L2} \leq$ spec. limit
Endurance	IEC 60384-18 / CECC 32300, subclause 4.15	T_{amb} = 105 °C; U_R applied; for test duration see Table 7	$\Delta C/C$: ± 20 % tan $\delta \leq 2 \times$ spec. limit $I_{L2} \leq$ 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	$\Delta C/C$: ± 20 % tan $\delta \leq 2 \times$ spec. limit $I_{L2} \leq$ spec. limit
Shelf life (storage at high temperature)	IEC 60384-18 / CECC 32300, subclause 4.17	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

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Телефон: +7 812 627 14 35

Электронная почта: sales@st-electron.ru

Адрес: 198099, Санкт-Петербург,
Промышленная ул, дом № 19, литера Н,
помещение 100-Н Офис 331