

Conductive Polymer Aluminum Capacitors SMD (Chip), Low Impedance, High Temperature

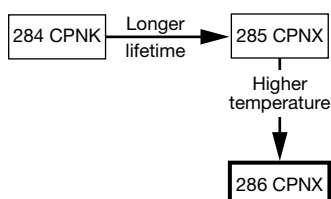


Fig. 1

QUICK REFERENCE DATA

DESCRIPTION	VALUE
Nominal case sizes (L x W x H in mm)	5.0 x 5.0 x 5.7 to 10.0 x 10.0 x 12.0
Rated capacitance range, C_R	10 μ F to 560 μ F
Tolerance on C_R	$\pm 20\%$
Rated voltage range, U_R	10 V to 50 V
Category temperature range	-55 °C to +125 °C
Endurance test at 125 °C	2000 h
Useful life at 125 °C	2000 h
Shelf life at 0 V, 125 °C	1000 h
Based on sectional specification	IEC 60384-25 / CECC 32300
Climatic category IEC 60068	55 / 125 / 56

FEATURES

- Useful life: up to 2000 h at 125 °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


RoHS
COMPLIANT

APPLICATIONS

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

MARKING

- Rated capacitance (in μ F)
- 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 (86)

PACKAGING

Supplied in blister tape on reel.

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

C_R (μ F)	U_R (V)					
	10	16	20	25	35	50
10	→	→	→	→	→	8 x 8 x 7.7
12	→	→	→	→	→	6.3 x 6.3 x 7.7
22	→	→	→	6.3 x 6.3 x 5.7	→	6.3 x 6.3 x 5.7
27	→	→	→	→	6.3 x 6.3 x 5.7	8 x 8 x 11.2
33	→	→	→	→	→	10 x 10 x 10
47	→	→	→	6.3 x 6.3 x 5.7 8 x 8 x 7.7	→	10 x 10 x 12
56	→	→	→	→	6.3 x 6.3 x 9	-
68	→	→	→	5 x 5 x 5.7	-	-
100	→	6.3 x 6.3 x 5.7	→	→	8 x 8 x 9.7	10 x 10 x 10
120	→	→	→	6.3 x 6.3 x 7.7	-	-
150	→	→	→	→	8 x 8 x 9.7	-
180	→	6.3 x 6.3 x 7.7	8 x 8 x 6.7	8 x 8 x 11.2	→	10 x 10 x 10
220	→	6.3 x 6.3 x 9	8 x 8 x 6.7	-	-	-
270	6.3 x 6.3 x 9	-	-	-	-	-
330	6.3 x 6.3 x 9	10 x 10 x 10	-	-	-	-
560	8 x 8 x 9.7	8 x 8 x 12.7	-	-	-	-

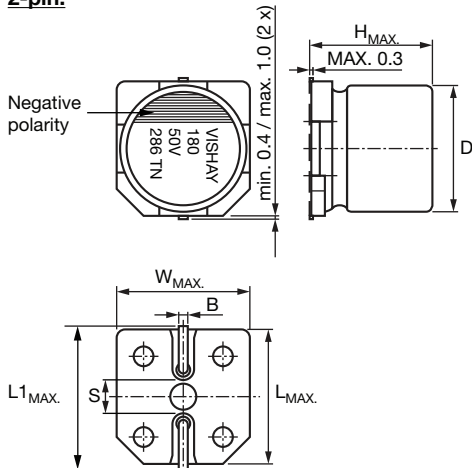
2-pin:


Fig. 2 - Dimensional outline

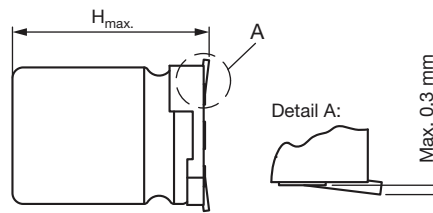


Fig. 3 - Coplanarity of pins

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)
5.0 x 5.0 x 5.7	0506	5.5	5.5	6.0	5.3	0.8	1.4	6.1	0.2
6.3 x 6.3 x 5.7	0606	6.8	6.8	6.0	6.3	0.8	2.1	7.5	0.3
6.3 x 6.3 x 7.7	0608	6.8	6.8	8.0	6.3	0.8	2.1	7.5	0.4
6.3 x 6.3 x 9.0	0609	6.8	6.8	10.0	6.3	1.1	2.1	7.5	0.4
8.0 x 8.0 x 6.7	0807	8.5	8.5	7.0	8.0	0.8	3.2	9.2	0.5
8.0 x 8.0 x 7.7	0808	8.5	8.5	8.0	8.0	1.1	3.2	9.2	0.6
8.0 x 8.0 x 9.7	0810	8.5	8.5	10.2	8.0	1.1	3.2	9.2	0.7
8.0 x 8.0 x 11.2	0811	8.5	8.5	11.7	8.0	1.1	3.2	9.2	0.8
8.0 x 8.0 x 12.7	0813	8.5	8.5	13.2	8.0	1.1	3.2	9.2	0.9
10.0 x 10.0 x 10.0	1010	10.5	10.5	10.5	10.0	1.1	4.6	11.2	1.1
10.0 x 10.0 x 12.0	1012	10.5	10.5	12.5	10.0	1.1	4.6	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
5.0 x 5.0 x 5.7	0506	12.0	16.0	6.6	380	1200
6.3 x 6.3 x 5.7	0606	12.0	16.0	6.7	380	1200
6.3 x 6.3 x 7.7	0608	12.0	16.0	8.6	380	900
6.3 x 6.3 x 9.0	0609	12.0	16.0	10.4	380	700
8.0 x 8.0 x 6.7	0807	12.0	24.0	7.6	380	1000
8.0 x 8.0 x 7.7	0808	12.0	24.0	8.5	380	900
8.0 x 8.0 x 9.7	0810	16.0	24.0	10.3	380	600
8.0 x 8.0 x 11.2	0811	16.0	24.0	12.0	380	500
8.0 x 8.0 x 12.7	0813	16.0	24.0	13.3	380	400
10.0 x 10.0 x 10.0	1010	16.0	24.0	10.9	380	500
10.0 x 10.0 x 12.0	1012	16.0	24.0	12.6	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.

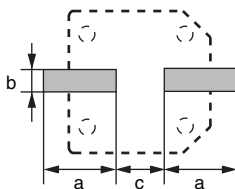


Fig. 4 - Recommended soldering pad dimensions

Table 3

RECOMMENDED SOLDERING PAD DIMENSIONS in millimeters				
NOMINAL CASE SIZE L x W x H	CASE CODE	a	b	c
5.0 x 5.0 x 5.7	0506	3.0	1.6	1.4
6.3 x 6.3 x 5.7	0606	3.5	1.6	2.1
6.3 x 6.3 x 7.7	0608	3.5	1.6	2.1
6.3 x 6.3 x 9.0	0609	3.5	1.6	2.1
8.0 x 8.0 x 6.7	0807	4.2	1.9	2.8
8.0 x 8.0 x 7.7	0808	4.2	1.9	2.8
8.0 x 8.0 x 9.7	0810	4.2	1.9	2.8
8.0 x 8.0 x 11.2	0811	4.2	1.9	2.8
8.0 x 8.0 x 12.7	0813	4.2	1.9	2.8
10.0 x 10.0 x 10.0	1010	4.4	1.9	4.3
10.0 x 10.0 x 12.0	1012	4.4	1.9	4.3

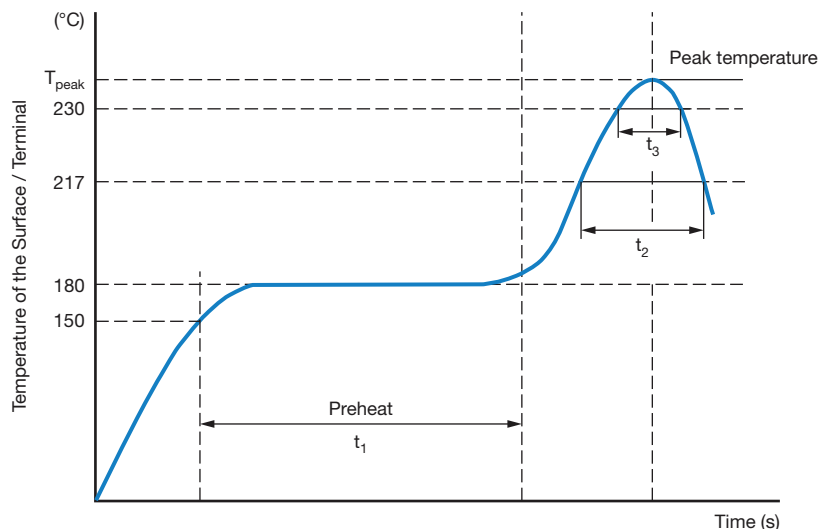
SOLDERING PROFILE FOR LEAD (Pb)-FREE REFLOW PROCESS


Fig. 5 - Maximum temperature load during reflow soldering

Table 4

REFLOW SOLDERING CONDITIONS for MAL2286xxxxxE3		
PROFILE FEATURES		
Maximum time between 150 °C to 180 °C (t_1)	120 s	
Ramp up rate from 217 °C to T_{peak}	0.5 K/s to 3 K/s	
Maximum time above 217 °C (t_2)	50 s	
Maximum time above 230 °C (t_3)	40 s	
Peak temperature T_{Peak}	250 °C	260 °C
Maximum reflow cycles	2	1
Ramp down rate T_{peak} to 217 °C	6 K/s max.	
Time 25 °C to T_{Peak}	8 min max.	

Notes

- Temperature measuring point on top of the case and on terminals
- MSL level 3 according to IPC/JEDEC J-STD-20 MSL classifications

ELECTRICAL DATA	
SYMBOL	DESCRIPTION
C_R	Rated capacitance at 120 Hz, tolerance $\pm 20 \%$
I_R 125 °C	Rated RMS ripple current at 100 kHz
I_{L2}	Max. leakage current after 2 min at U_R
$\tan \delta$	Max. dissipation factor at 120 Hz
ESR	Max. ESR at 100 kHz

Note

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

ORDERING EXAMPLE

Conductive polymer 286 CPNX series

120 μF / 25 V; $\pm 20 \%$

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

Ordering code: MAL228697605E3



Table 5

ELECTRICAL DATA AND ORDERING INFORMATION								
U_R (V)	C_R (μ F)	NOMINAL CASE SIZE L x W x H (mm)	I_R 105 °C 100 kHz (mA)	I_R 125 °C 100 kHz (mA)	I_{L2} 2 min (μ A)	$\tan \delta$ 120 Hz	ESR 100 kHz 20 °C (m Ω)	ORDERING CODE MAL2286...
10	270	6.3 x 6.3 x 9	3950	1650	540	0.12	20	97401E3
	330	6.3 x 6.3 x 9	3950	1650	660	0.12	25	97402E3
	560	8 x 8 x 9.7	4000	1333	1120	0.12	25	97403E3
16	100	6.3 x 6.3 x 5.7	2490	700	320	0.12	20	97501E3
	180	6.3 x 6.3 x 7.7	2700	850	576	0.12	25	97502E3
	220	6.3 x 6.3 x 9	3300	1040	704	0.12	22	97503E3
	330	10 x 10 x 10	4350	1350	1050	0.12	16	97504E3
	560	8 x 8 x 12.7	5400	1630	1792	0.12	16	97505E3
20	180	8 x 8 x 6.7	4650	1600	720	0.12	29	97551E3
	220	8 x 8 x 6.7	4800	1600	880	0.12	29	97552E3
25	22	6.3 x 6.3 x 5.7	1400	560	280	0.12	35	97601E3
	47	6.3 x 6.3 x 5.7	3000	1175	235	0.12	42	97602E3
	47	8 x 8 x 7.7	3600	1300	235	0.12	35	97603E3
	68	5 x 5 x 5.7	3100	885	340	0.12	30	97604E3
	120	6.3 x 6.3 x 7.7	3200	1012	600	0.12	30	97605E3
	180	8 x 8 x 11.2	2800	1080	900	0.12	18	97606E3
35	27	6.3 x 6.3 x 5.7	1500	500	300	0.12	50	97001E3
	56	6.3 x 6.3 x 9	2400	800	392	0.12	40	97002E3
	100	8 x 8 x 9.7	2200	700	700	0.12	29	97003E3
	150	8 x 8 x 9.7	2700	900	1050	0.12	35	97004E3
50	10	8 x 8 x 7.7	1400	450	100	0.12	75	97101E3
	12	6.3 x 6.3 x 7.7	1400	450	120	0.12	75	97102E3
	22	6.3 x 6.3 x 5.7	3100	1100	220	0.12	35	97103E3
	27	8 x 8 x 11.2	2400	760	270	0.12	40	97104E3
	33	10 x 10 x 10	2200	700	330	0.12	42	97105E3
	47	10 x 10 x 12	2800	885	470	0.12	30	97106E3
	100	10 x 10 x 10	2500	760	1000	0.12	40	97107E3
	180	10 x 10 x 10	3000	950	1800	0.12	24	97108E3

Table 6

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

USEFUL LIFE AND ENDURANCE

Table 7

ENDURANCE TEST AND USEFUL LIFE							
SERIES	CASE CODE	USEFUL LIFE AT 125 °C (h) ⁽¹⁾	ENDURANCE AT 125 °C (h)	ENDURANCE AT 105 °C (h)	ENDURANCE AT 85 °C (h)	ENDURANCE AT 75 °C (h)	ENDURANCE AT 65 °C (h)
286 CPNX	0506 to 1012	2000	2000	20 000	200 000	630 000	2 000 000

Note
⁽¹⁾ Identical with endurance for this series

Endurance can be calculated by formula below:

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

L: estimated lifetime (h)

 $L_{T_{max}}$: 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	$\geq 100\,000$
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"	$\Delta C/C: \pm 5\%$ $\tan \delta \leq \text{spec. limit}$ $I_{L2} \leq \text{spec. limit}$
Endurance	IEC 60384-25 / CECC 32300, subclause 4.15	$T_{amb} = 125\text{ °C}$; U_R applied; for test duration see Table 7	$\Delta C/C: \pm 20\%$ $\tan \delta \leq 1.5 \times \text{spec. limit}$ $I_{L2} \leq \text{spec. limit}$ $ESR \leq 1.5 \times \text{spec. limit}$
Useful life	CECC 30301, subclause 1.8.1	$T_{amb} = 125\text{ °C}$; U_R and I_R applied; for test duration see Table 7	$\Delta C/C: \pm 20\%$ $\tan \delta \leq 1.5 \times \text{spec. limit}$ $I_{L2} \leq \text{spec. limit}$ $ESR \leq 1.5 \times \text{spec. limit}$
Shelf life (storage at high temperature)	IEC 60384-25 / CECC 32300, subclause 4.16	$T_{amb} = 125\text{ °C}$; 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.



Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Hyperlinks included in this datasheet may direct users to third-party websites. These links are provided as a convenience and for informational purposes only. Inclusion of these hyperlinks does not constitute an endorsement or an approval by Vishay of any of the products, services or opinions of the corporation, organization or individual associated with the third-party website. Vishay disclaims any and all liability and bears no responsibility for the accuracy, legality or content of the third-party website or for that of subsequent links.

Vishay products are not designed for use in life-saving or life-sustaining applications or any application in which the failure of the Vishay product could result in personal injury or death unless specifically qualified in writing by Vishay. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.