

Hybrid Conductive Polymer Aluminum Capacitors SMD (Chip), Low Impedance

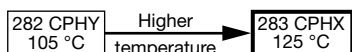


Fig. 1

QUICK REFERENCE DATA

DESCRIPTION	VALUE
Nominal case sizes (L x W x H in mm)	6.3 x 6.3 x 5.7 to 10.0 x 10.0 x 16.5
Rated capacitance range, C _R	22 µF to 1000 µF
Tolerance on C _R	± 20 %
Rated voltage range, U _R	25 V to 80 V
Category temperature range	-55 °C to +125 °C
Endurance test at 125 °C	4000 h
Useful life at 125 °C	4000 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

- Long useful life: up to 4000 h at 125 °C
- Very low ESR and high ripple current
- High voltages up to 80 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 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 (83)

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 (µF)	U _R (V)				
	25	35	50	63	80
22	→	→	→	6.3 x 6.3 x 7.7	8 x 8 x 10.5
33	→	→	6.3 x 6.3 x 7.7	8 x 8 x 10.5	10 x 10 x 10
47	→	6.3 x 6.3 x 5.7	8 x 8 x 10.5	8 x 8 x 10.5	10 x 10 x 10
56	→	→	→	10 x 10 x 10	10 x 10 x 12
68	→	6.3 x 6.3 x 7.7	8 x 8 x 10.5	10 x 10 x 10	10 x 10 x 13.5
82	→	→	8 x 8 x 10.5	10 x 10 x 10	10 x 10 x 16.5
100	6.3 x 6.3 x 7.7	6.3 x 6.3 x 9	10 x 10 x 10	10 x 10 x 12	10 x 10 x 16.5
120	→	→	10 x 10 x 10	10 x 10 x 12	-
150	6.3 x 6.3 x 9	8 x 8 x 10.5	10 x 10 x 10	10 x 10 x 16.5	-
160	→	→	→	10 x 10 x 16.5	-
180	→	→	10 x 10 x 13.5	10 x 10 x 16.5	-

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)				
	25	35	50	63	80
220	8 x 8 x 10.5	10 x 10 x 10	10 x 10 x 13.5 10 x 10 x 16.5	-	-
270	8 x 8 x 10.5	10 x 10 x 10	-	-	-
330	10 x 10 x 10	10 x 10 x 10	-	-	-
390	→	10 x 10 x 12	-	-	-
470	10 x 10 x 10	10 x 10 x 13.5	-	-	-
560	10 x 10 x 12	-	-	-	-
680	10 x 10 x 16.5	-	-	-	-
1000	10 x 10 x 16.5	-	-	-	-

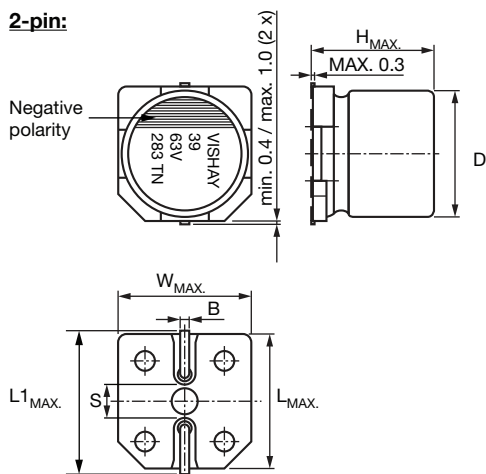
2-pin:


Fig. 2 - Dimensional outline

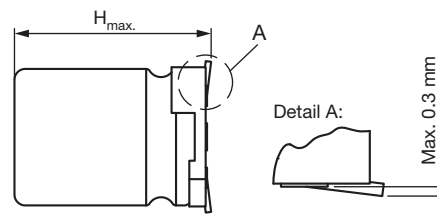


Fig. 3 - Coplanarity of pins

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)
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	0609	6.8	6.8	10.0	6.3	1.1	2.1	7.5	0.4
8 x 8 x 10.5	0810	8.5	8.5	11.0	8.0	1.1	3.2	9.2	0.8
10 x 10 x 10	1010	10.5	10.5	10.5	10.0	1.1	4.6	11.2	1.1
10 x 10 x 12	1012	10.5	10.5	12.5	10.0	1.1	4.6	11.2	1.3
10 x 10 x 13.5	1013	10.5	10.5	14.0	10.0	1.1	4.6	11.2	1.5
10 x 10 x 16.5	1016	10.5	10.5	17.0	10.0	1.1	4.6	11.2	1.8

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 5.7	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 10.5	0810	16.0	24.0	11.2	380	500
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
10.0 x 10.0 x 13.5	1014	16.0	24.0	14.2	380	400
10.0 x 10.0 x 16.5	1016	24.0	32.0	17.0	380	200

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.

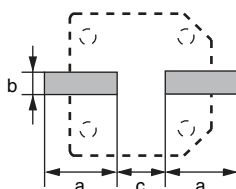
SOLDERING

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
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 10.5	0810	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
10.0 x 10.0 x 13.5	1014	4.4	1.9	4.3
10.0 x 10.0 x 16.5	1016	4.4	1.9	4.3

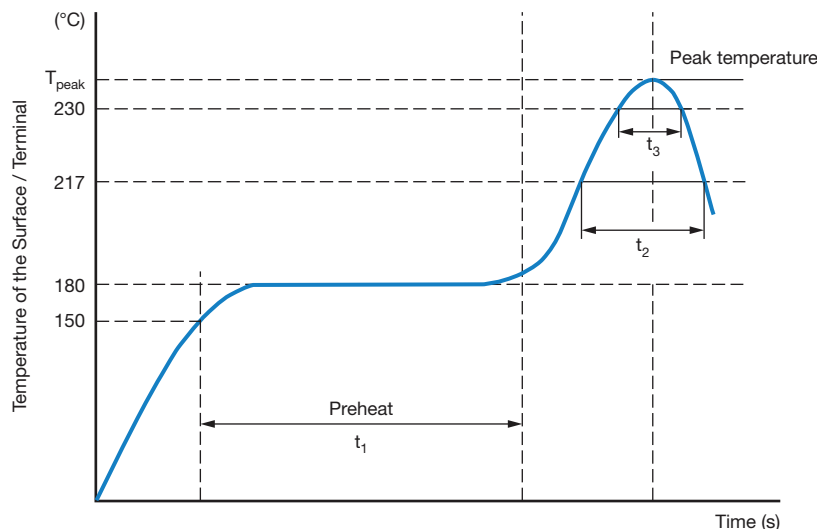
SOLDERING PROFILE FOR LEAD (Pb)-FREE REFLOW PROCESS


Fig. 5 - Maximum temperature load during reflow soldering

Table 4

REFLOW SOLDERING CONDITIONS for MAL2283xxxxxE3		
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.	

Note

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

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

Hybrid conductive polymer 283 CPHX series

100 μF / 25 V; $\pm 20\%$

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

Ordering code: MAL228397601E3



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 125 °C 100 kHz (mA)	I_{L2} 2 min (μ A)	$\tan \delta$ 120 Hz	ESR 100 kHz 20 °C (m Ω)	ORDERING CODE MAL2283...
25	100	6.3 x 6.3 x 7.7	1400	25.0	0.14	30	97601E3
	150	6.3 x 6.3 x 9	1800	37.5	0.14	30	97602E3
	220	8 x 8 x 10.5	1600	55.0	0.14	27	97603E3
	270	8 x 8 x 10.5	2000	67.5	0.14	27	97604E3
	330	10 x 10 x 10	2000	82.5	0.14	20	97605E3
	470	10 x 10 x 10	2800	117.5	0.14	20	97606E3
	560	10 x 10 x 12	3200	140.0	0.14	18	97607E3
	1000	10 x 10 x 16.5	4000	250.0	0.14	14	97608E3
35	47	6.3 x 6.3 x 5.7	900	49.4	0.12	60	97001E3
	68	6.3 x 6.3 x 7.7	1400	71.4	0.12	35	97002E3
	100	6.3 x 6.3 x 9	1700	35.0	0.12	35	97003E3
	150	8 x 8 x 10.5	1600	52.5	0.12	27	97004E3
	220	10 x 10 x 10	2000	77.0	0.12	20	97005E3
	270	10 x 10 x 10	2000	94.5	0.12	20	97006E3
	330	10 x 10 x 10	2800	115.5	0.12	20	97008E3
	390	10 x 10 x 12	3000	136.5	0.12	20	97009E3
	470	10 x 10 x 13.5	3500	164.5	0.12	14	97011E3
50	680	10 x 10 x 16.5	4000	238.0	0.12	14	97012E3
	33	6.3 x 6.3 x 7.7	1100	16.5	0.10	40	97101E3
	47	8 x 8 x 10.5	1250	23.5	0.10	30	97102E3
	68	8 x 8 x 10.5	1250	34.0	0.10	30	97103E3
	82	8 x 8 x 10.5	1250	41.0	0.10	30	97104E3
	100	10 x 10 x 10	1600	50.0	0.10	28	97105E3
	120	10 x 10 x 10	1600	60.0	0.10	28	97106E3
	150	10 x 10 x 10	2000	75.0	0.10	25	97107E3
	180	10 x 10 x 13.5	3000	90.0	0.10	19	97108E3
	220	10 x 10 x 13.5	3000	110.0	0.10	19	97109E3
63	220	10 x 10 x 16.5	3600	110.0	0.10	13	97111E3
	22	6.3 x 6.3 x 7.7	900	41.6	0.08	80	97801E3
	33	8 x 8 x 10.5	1100	20.8	0.08	40	97802E3
	47	8 x 8 x 10.5	1500	29.6	0.08	40	97803E3
	56	10 x 10 x 10	1400	35.3	0.08	30	97804E3
	68	10 x 10 x 10	1400	42.8	0.08	30	97805E3
	82	10 x 10 x 10	2800	51.7	0.08	25	97806E3
	100	10 x 10 x 12	1900	63.0	0.08	22	97807E3
	120	10 x 10 x 12	1900	75.6	0.08	22	97808E3
	150	10 x 10 x 16.5	3300	94.5	0.08	15	97809E3
	160	10 x 10 x 16.5	3300	100.8	0.08	15	97811E3
80	180	10 x 10 x 16.5	3300	113.4	0.08	15	97812E3
	22	8 x 8 x 10.5	1050	17.6	0.08	45	97701E3
	33	10 x 10 x 10	1360	26.4	0.08	36	97702E3
	47	10 x 10 x 10	1700	37.6	0.08	33	97703E3
	56	10 x 10 x 12	1360	44.8	0.08	36	97704E3
	68	10 x 10 x 13.5	2100	54.4	0.08	28	97705E3
	82	10 x 10 x 16.5	2300	65.6	0.08	28	97706E3
	100	10 x 10 x 16.5	2800	80.0	0.08	25	97707E3

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)
283 CPHX	0606 to 1016	4000	4000	16 000	64 000	128 000	256 000

Note

⁽¹⁾ Identical with endurance for this series

Endurance can be calculated by formula below:

$$L = L_{T_{max.}} \times 2^{\frac{T_{max.} - T_a}{10}}$$

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			
0.1	0.3	0.6	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	$T_{amb} = 125\,^{\circ}\text{C}$; U_R applied; for test duration see Table 7	$\Delta C/C: \pm 30\%$ $\tan \delta \leq 2 \times \text{spec. limit}$ $I_{L2} \leq \text{spec. limit}$ $ESR \leq 2 \times \text{spec. limit}$
Useful life	CECC 30301, subclause 1.8.1	$T_{amb} = 125\,^{\circ}\text{C}$; U_R and I_R applied; for test duration see Table 7	$\Delta C/C: \pm 30\%$ $\tan \delta \leq 2 \times \text{spec. limit}$ $I_{L2} \leq \text{spec. limit}$ $ESR \leq 2 \times \text{spec. limit}$
Shelf life (storage at high temperature)	IEC 60384-25 / CECC 32300, subclause 4.16	$T_{amb} = 125\,^{\circ}\text{C}$; 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.



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