183 CPHT





182 CPHZ higher 183 CPHT 105 °C temperature 125 °C

Fig. 1

QUICK REFERENCE DATA					
DESCRIPTION	VALUE				
Nominal case sizes (L x W x H in mm)	5.0 x 5.0 x 5.8 to 10.0 x 10.0 x 16.5				
Rated capacitance range, C <sub>R</sub>	10 μF to 330 μF				
Tolerance on C <sub>R</sub>	± 20 %				
Rated voltage range, U <sub>R</sub>	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 <u>www.vishay.com/doc?99912</u>

#### **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 CH	SELECTION CHART FOR C <sub>R</sub> , U <sub>R</sub> , AND RELEVANT NOMINAL CASE SIZES (L x W x H in mm)							
C <sub>R</sub>	U <sub>R</sub> (V)							
(μF)	25	35	50	63	80			
10	$\rightarrow$	$\rightarrow$	5.0 x 5.0 x 5.8	6.3 x 6.3 x 5.8	-			
22	$\rightarrow$	5.0 x 5.0 x 5.8	6.3 x 6.3 x 5.8	6.3 x 6.3 x 7.7	8.0 x 8.0 x 10.5			
33	5.0 x 5.0 x 5.8	$\rightarrow$	6.3 x 6.3 x 7.7	8.0 x 8.0 x 10.5	10.0 x 10.0 x 10.5			
47	$\rightarrow$	6.3 x 6.3 x 5.8	$\rightarrow$	$\rightarrow$	10.0 x 10.0 x 10.5			
56	6.3 x 6.3 x 5.8	$\rightarrow$	$\rightarrow$	10.0 x 10.0 x 10.5	-			
68	$\rightarrow$	6.3 x 6.3 x 7.7	8.0 x 8.0 x 10.5	10.0 x 10.0 x 10.5	-			
100	6.3 x 6.3 x 7.7	$\rightarrow$	10.0 x 10.0 x 10.5	-	-			
120	$\rightarrow$	$\rightarrow$	10.0 x 10.0 x 10.5	-	-			
150	$\rightarrow$	8.0 x 8.0 x 10.5	-	10.0 x 10.0 x 16.5	-			
220	8.0 x 8.0 x 10.5	-	-	-	-			
270	$\rightarrow$	10.0 x 10.0 x 10.5	-	-	-			
330	10.0 x 10.0 x 10.5	-	-	-	-			

1

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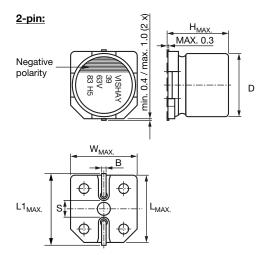


Fig. 2 - Dimensional outline

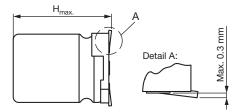


Fig. 3 - Coplanarity of pins

#### Table 1

DIMENSIONS in millimeters AND MASS									
NOMINAL CASE SIZE L x W x H	CASE CODE	L <sub>MAX.</sub>	W <sub>MAX.</sub>	H <sub>MAX.</sub>	ØD	B <sub>MAX.</sub>	S	L1 <sub>MAX.</sub>	MASS (g)
5.0 x 5.0 x 5.8	0506	5.5	5.5	6.1	5.0	0.8	1.4	6.1	0.2
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 10.5	0810	8.5	8.5	10.8	8.0	1.1	3.1	9.2	0.9
10.0 x 10.0 x 10.5	1010	10.5	10.5	10.8	10.0	1.1	4.5	11.2	1.2
10.0 x 10.0 x 16.5	1016	10.5	10.5	16.8	10.0	1.4	4.5	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 P1	TAPE WIDTH W	TAPE THICKNESS T <sub>2</sub>	REEL DIAMETER	PACKAGING QUANTITY PER REEL
5.0 x 5.0 x 5.8	0506	12	12	6.1	380	1000
6.3 x 6.3 x 5.8	0606	12	16	5.7	380	1000
6.3 x 6.3 x 7.7	0608	12	16	8.0	380	900
8.0 x 8.0 x 10.5	0810	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 16.5	1016	16	24	17.5	380	250

#### 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.

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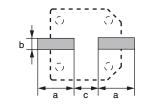


Fig. 4 - Recommended soldering pad dimensions

Table 3
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RECOMMENDED SOLDERING PAD DIMENSIONS in millimeters						
NOMINAL CASE SIZE L x W x H	CASE CODE	а	b	c		
5.0 x 5.0 x 5.8	0506	3.0	1.6	1.4		
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 10.5	0810	4.2	1.9	2.8		
10.0 x 10.0 x 10.5	1010	4.4	1.9	4.3		
10.0 x 10.0 x 16.5	1016	4.4	2.2	4.3		

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

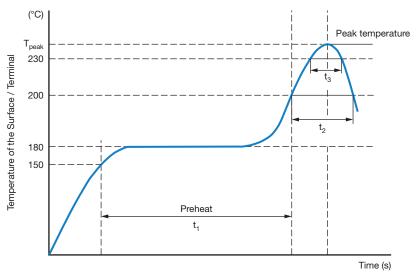


Fig. 5 - Maximum temperature load during reflow soldering

#### Table 4

REFLOW SOLDERING CONDITIONS for MAL2183xxxxxE3					
PROFILE FEATURES	Ø ≤ 6.3 mm	Ø ≥ 8	mm		
Maximum time between 150 °C to 200 °C (t <sub>1</sub> )	120 s	120	) s		
Ramp up rate from 217 °C to T <sub>peak</sub>	0.5	K/s to 3 K/s			
Maximum time above 200 °C (t <sub>2</sub> )	70 s	70	S		
Maximum time above 230 °C (t <sub>3</sub> )	30 s	30	S		
Maximum time above liquidus (217 °C)	40 s	40	S		
Peak temperature T <sub>Peak</sub>	260 °C	260 °C	245 °C		
Maximum reflow cycles	2	1	2		
Maximum time within 5 °C below T <sub>peak</sub>	5 5 10		10		
Ramp down rate T <sub>peak</sub> to 217 °C	6 K/s max.				
Time 25 °C to T <sub>Peak</sub>	8 min max.				

#### Note

Temperature measuring point on top of the case and on terminals

Revision: 31-Oct-2023

3

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183 CPHT

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## ELECTRICAL DATA

SYMBOL	DESCRIPTION			
C <sub>R</sub>	Rated capacitance at 120 Hz, tolerance $\pm$ 20 %			
I <sub>R</sub> 125 °C	Rated RMS ripple current at 100 kHz			
I <sub>L2</sub>	Max. leakage current after 2 min at U <sub>R</sub>			
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 %

#### Table 5

# Vishay BCcomponents

**ORDERING EXAMPLE** 

Hybrid conductive polymer 183 CPHT series 100  $\mu$ F / 25 V; ± 20 % Nominal case size: 6.3 mm x 6.3 mm x 7.7 mm; taped on reel Ordering code: MAL218397603E3

**ELECTRICAL DATA AND ORDERING INFORMATION** NOMINAL ESR I<sub>R</sub> 125 °C I<sub>L2</sub> 2 min U<sub>R</sub> (V) CASE SIZE 100 kHz **ORDERING CODE**  $C_R$ tan  $\delta$ (µF) LxWxH 100 kHz 120 Hz 20 °C MAL2183... (µA) (mΩ) (mm) (mA) 33 5.0 x 5.0 x 5.8 550 8.3 0.14 80 97601E3 56 6.3 x 6.3 x 5.8 900 14 0.14 50 97602E3 100 1400 25 0.14 30 97603E3 25 6.3 x 6.3 x 7.7 8.0 x 8.0 x 10.5 27 97604E3 220 1600 55 0.14 330 10.0 x 10.0 x 10.5 2000 82.5 20 97605E3 0.14 22 5.0 x 5.0 x 5.8 550 7.7 0.12 100 97001E3 97002E3 47 6.3 x 6.3 x 5.8 900 16.5 0.12 60 35 68 6.3 x 6.3 x 7.7 1400 23.8 0.12 35 97003E3 150 8.0 x 8.0 x 10.5 1600 52.5 0.12 27 97004E3 270 10.0 x 10.0 x 10.5 2000 94.5 0.12 20 97005E3 500 5 120 10 5.0 x 5.0 x 5.8 0.1 97101E3 22 6.3 x 6.3 x 5.8 750 11 0.1 80 97102E3 33 6.3 x 6.3 x 7.7 1100 16.5 0.1 40 97103E3 50 68 8.0 x 8.0 x 10.5 1250 34 0.1 30 97104E3 100 10.0 x 10.0 x 10.5 1600 50 0.1 28 97105E3 120 10.0 x 10.0 x 10.5 1600 0.1 28 97106E3 60 10 6.3 x 6.3 x 5.8 700 6.3 0.08 120 97801E3 22 6.3 x 6.3 x 7.7 900 13.9 0.08 80 97802E3 0.08 40 33 8.0 x 8.0 x 10.5 1100 20.8 97803E3 63 10.0 x 10.0 x 10.5 30 56 1400 35.3 0.08 97804E3 68 10.0 x 10.0 x 10.5 1400 42.8 0.08 30 97805E3 150 10.0 x 10.0 x 16.5 3500 94.5 0.08 15 97811E3 22 8.0 x 8.0 x 10.5 1050 17.6 0.08 45 97806E3 33 10.0 x 10.0 x 10.5 1360 26.4 0.08 36 97701E3 80 47 10.0 x 10.0 x 10.5 1360 37.6 0.08 36 97702E3

#### Table 6

ADDITIONAL ELECTRICAL DATA						
PARAMETER	PARAMETER CONDITIONS VALUE					
Voltage						
Surge voltage for short periods	IEC 60384-25, subclause 4.14	$U_s \le 1.15 \text{ x } U_R$				

Revision: 31-Oct-2023

5



### **USEFUL LIFE AND ENDURANCE**

Table 7

ENDURANCE TEST AND USEFUL LIFE							
SERIES CASE CODE USEFUL LIFE AT 125 °C (h) <sup>(1)</sup> 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)							
183 CPHT	0506 to 1016	4000	4000	16 000	64 000	128 000	256 000

Note

L =

<sup>(1)</sup> Identical with endurance for this series

Endurance can be calculated by formula below:

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

L: estimated lifetime (h)

L<sub>Tmax.</sub>: base lifetime specified at maximum operating temperature with applied DC voltage (h)

T<sub>max</sub>: rated maximum operating temperature (°C)

T<sub>a</sub>: actual ambient temperature (°C)

#### Table 8

MULTIPLIER OF RIPPLE CURRENT (IR) AS A FUNCTION OF FREQUENCY					
FREQUENCY (Hz)					
120	1000	10 000	≥ <b>100 000</b>		
I <sub>R</sub> MULTIPLIER					
0.1	0.3	0.6	1		

#### Table 9

TEST PROCEDURES AND REQUIREMENTS						
TEST		PROCEDURE	REQUIREMENTS			
NAME OF TEST	REFERENCE	(quick reference)	REQUIREMENTS			
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"	$\begin{array}{l} \Delta C/C: \pm 5 \ \% \\ tan \ \delta \leq spec. \ limit \\ I_{L2} \leq spec. \ limit \end{array}$			
Endurance	IEC 60384-25 / CECC 32300, subclause 4.15	$T_{amb} = 125 \text{ °C; } U_R \text{ applied;}$ for test duration see Table 7	$\begin{array}{l} \Delta C/C: \pm 30 \ \%\\ tan \ \delta \leq 2 \ x \ spec. \ limit\\ I_{L2} \leq spec. \ limit\\ ESR \leq 2 \ x \ spec. \ limit \end{array}$			
Useful life	CECC 30301, subclause 1.8.1	T <sub>amb</sub> = 125 °C; U <sub>R</sub> and I <sub>R</sub> applied; for test duration see Table 7	$\begin{array}{l} \Delta C/C: \pm 30 \ \%\\ tan \ \delta \leq 2 \ x \ spec. \ limit\\ I_{L2} \leq spec. \ limit\\ ESR \leq 2 \ x \ spec. \ limit \end{array}$			
Shelf life (storage at high temperature)	IEC 60384-25 / CECC 32300, subclause 4.16	$T_{amb}$ = 125 °C; no voltage applied; 1000 h after test: U <sub>R</sub> 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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