



# HKH HIGH RELIABILITY ELECTROLYTIC CAPACITOR

High temperature range up to +125°C

Suitable for automotive equipment

Load life of 1000~5000 hours

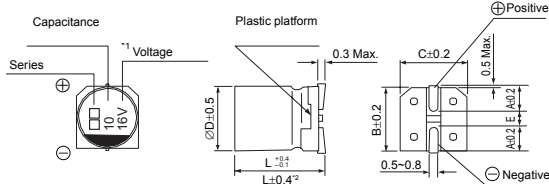
RoHS & REACH compliant, Halogen-free

## SPECIFICATIONS

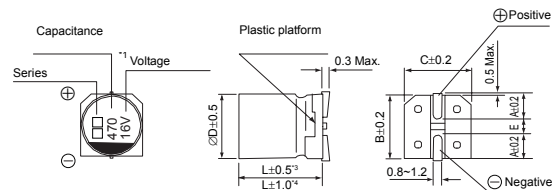
Items	Characteristics																															
Operation Temperature Range	-40 ~ +125°C																															
Voltage Range	10 ~ 450V																															
Capacitance Range	3.3 ~ 4700µF																															
Capacitance Tolerance	±20% at 120Hz, 20°C																															
Leakage Current	Leakage current ≤0.03CV or 4µA (10V~100V), whichever is greater (after 2 minutes application of rated voltage at 20°C) Leakage current ≤0.04CV + 100µA (160V~450V), whichever is greater (after 2 minutes application of rated voltage at 20°C) C: Nominal capacitance (µF), V: Rated voltage (V)																															
Dissipation Factor (tan δ)	Measurement frequency : 120Hz, Temperature : 20°C <table border="1"> <tr> <td>Rated Voltage (V)</td> <td>10</td> <td>16</td> <td>25</td> <td>35</td> <td>50</td> <td>63</td> <td>100</td> <td>160~250</td> <td>400,450</td> </tr> <tr> <td rowspan="2">tan δ (max.)</td> <td>∅4~∅10</td> <td>0.24</td> <td>0.20</td> <td>0.16</td> <td>0.14</td> <td>0.14</td> <td>0.18</td> <td>0.18</td> <td>—</td> </tr> <tr> <td>∅12.5~∅18</td> <td>0.22</td> <td>0.18</td> <td>0.16</td> <td>0.14</td> <td>0.12</td> <td>0.14</td> <td>0.10</td> <td>0.20</td> </tr> </table>	Rated Voltage (V)	10	16	25	35	50	63	100	160~250	400,450	tan δ (max.)	∅4~∅10	0.24	0.20	0.16	0.14	0.14	0.18	0.18	—	∅12.5~∅18	0.22	0.18	0.16	0.14	0.12	0.14	0.10	0.20		
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Stability at Low Temperature	Measurement frequency : 120Hz <table border="1"> <tr> <td>Rated Voltage (V)</td> <td>10</td> <td>16</td> <td>25</td> <td>35~100</td> <td>160~250</td> <td>400,450</td> </tr> <tr> <td rowspan="2">Impedance Ratio</td> <td rowspan="2">∅4~∅10</td> <td>Z(-25°C) / Z(20°C)</td> <td>4</td> <td>3</td> <td>2</td> <td>2</td> </tr> <tr> <td>Z(-40°C) / Z(20°C)</td> <td>10</td> <td>8</td> <td>6</td> <td>4</td> </tr> <tr> <td rowspan="2">ZT/Z20 (max.)</td> <td rowspan="2">∅12.5~∅18</td> <td>Z(-25°C) / Z(20°C)</td> <td>4</td> <td>3</td> <td>2</td> <td>2</td> </tr> <tr> <td>Z(-40°C) / Z(20°C)</td> <td>8</td> <td>6</td> <td>4</td> <td>3</td> </tr> </table>	Rated Voltage (V)	10	16	25	35~100	160~250	400,450	Impedance Ratio	∅4~∅10	Z(-25°C) / Z(20°C)	4	3	2	2	Z(-40°C) / Z(20°C)	10	8	6	4	ZT/Z20 (max.)	∅12.5~∅18	Z(-25°C) / Z(20°C)	4	3	2	2	Z(-40°C) / Z(20°C)	8	6	4	3
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Load Life	The characteristics listed below shall be satisfied when the capacitors are restored to 20°C after the rated voltage is applied for the specified time at 125°C. <table border="1"> <tr> <th>Size (mm)</th> <th>Life time (hours)</th> </tr> <tr> <td>∅6.3</td> <td>1000</td> </tr> <tr> <td>∅D8, ∅10 (10~100V)</td> <td>2000</td> </tr> <tr> <td>∅D12.5~18 (160~450V)</td> <td>2000</td> </tr> <tr> <td>∅D12.5~18 (10~100V)</td> <td>5000</td> </tr> </table> <table border="1"> <tr> <td>Capacitance Change</td> <td>Within ±30% of initial value</td> </tr> <tr> <td>Dissipation Factor</td> <td>300% or less of initial specified value</td> </tr> <tr> <td>Leakage Current</td> <td>initial specified value or less</td> </tr> </table>	Size (mm)	Life time (hours)	∅6.3	1000	∅D8, ∅10 (10~100V)	2000	∅D12.5~18 (160~450V)	2000	∅D12.5~18 (10~100V)	5000	Capacitance Change	Within ±30% of initial value	Dissipation Factor	300% or less of initial specified value	Leakage Current	initial specified value or less															
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Shelf Life	After leaving capacitors under no load at 125°C for 1000 hours, they meet the specified value for load life characteristics listed above.																															
Resistance to Soldering Heat	After reflow soldering and restored at room temperature, they meet the characteristics listed below. <table border="1"> <tr> <td>Capacitance Change</td> <td>Within ±10% of initial value</td> </tr> <tr> <td>Dissipation Factor</td> <td>initial specified value or less</td> </tr> <tr> <td>Leakage Current</td> <td>initial specified value or less</td> </tr> </table>	Capacitance Change	Within ±10% of initial value	Dissipation Factor	initial specified value or less	Leakage Current	initial specified value or less																									
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Marking	Black print on the case top.																															

## DRAWING (Unit: mm)

(∅4~∅6.3×7.7)



(∅8×10.5~∅18)



\*1. Voltage mark for 6.3V is [6V]  
\*2. Applicable to ∅6.3×7.7

\*3. Applicable to ∅8×10.5~∅10  
\*4. Applicable to ∅12.5~∅18

Dimension table in next page.



**DIMENSIONS (Unit: mm)**

∅D x L	4 x 5.8	5 x 5.8	6.3 x 5.8	6.3 x 7.7	8 x 10.5	10 x 10.5	10 x 13.5	12.5 x 13.5	12.5 x 16	16 x 16.5	18 x 16.5
A	2.0	2.2	2.6	2.6	3.0	3.3	3.3	4.9	4.9	5.8	6.2
B	4.3	5.3	6.6	6.6	8.4	10.4	10.4	13.0	13.0	17.0	19.0
C	4.3	5.3	6.6	6.6	8.4	10.4	10.4	13.0	13.0	17.0	19.0
E ± 0.2	1.0	1.4	1.9	1.9	3.1	4.7	4.7	4.7	4.7	6.4	6.4
L	5.8	5.8	5.8	7.7	10.5	10.5	13.5	13.5	16.0	16.5	18.5

**DIMENSIONS & MAXIMUM PERMISSIBLE RIPPLE CURRENT & ESR**

WV Parameter μF		10				16				25			
		Case size ∅DxL (mm)	E.S.R. (Ω) 20°C	E.S.R. (Ω) -40°C	Ripple current (mA rms) at 125°C, 100KHz	Case size ∅DxL (mm)	E.S.R. (Ω) 20°C	E.S.R. (Ω) -40°C	Ripple current (mA rms) at 125°C, 100KHz	Case size ∅DxL (mm)	E.S.R. (Ω) 20°C	E.S.R. (Ω) -40°C	Ripple current (mA rms) at 125°C, 100KHz
33	336									6.3 x 5.8	3.3	66	45
47	476					6.3 x 5.8	3.3	66	43	6.3 x 7.7	2.3	46	68
100	107	6.3 x 7.7	2.3	46	72	8 x 10.5	1.0	20	115	8 x 10.5	1.0	20	126
220	227	8 x 10.5	1.0	20	136	10 x 10.5	0.7	13.4	175	10 x 10.5	0.7	13.4	211
330	337	10 x 10.5	0.7	13.4	188	10 x 13.5	0.5	9.5	280	12.5 x 13.5 (10x13.5)	0.14 (0.5)	2.1 (9.5)	750 (270)
470	477	10 x 13.5	0.5	9.5	300	12.5 x 13.5	0.14	2.1	750	12.5 x 13.5	0.14	2.1	750
680	687					16 x 16.5 (12.5x13.5)	0.10 (0.14)	1.5 (2.1)	1000 (750)	16 x 16.5	0.10	1.5	1000
1000	108	12.5 x 16 (12.5x13.5)	0.11 (0.14)	1.5 (2.1)	900 (750)	16 x 16.5	0.10	1.5	1000	16 x 16.5	0.10	1.5	1000
2200	228	16 x 16.5	0.10	1.5	1000	18 x 16.5	0.09	1.5	1100				
3300	338	18 x 16.5	0.09	1.5	1100								
4700	478	18 x 16.5	0.09	1.5	1100								

WV Parameter μF		35				50			
		Case size ∅DxL (mm)	E.S.R. (Ω) 20°C	E.S.R. (Ω) -40°C	Ripple current (mA rms) at 125°C, 100KHz	Case size ∅DxL (mm)	E.S.R. (Ω) 20°C	E.S.R. (Ω) -40°C	Ripple current (mA rms) at 125°C, 100KHz
10	106	6.3 x 5.8	3.3	66	38	6.3 x 7.7 (6.3 x 5.8)	2.3 (3.3)	46 (66)	50 (38)
22	226	6.3 x 5.8	3.3	66	39	6.3 x 7.7	2.3	46	50
33	336	6.3 x 7.7	2.3	46	62	8 x 10.5	1.0	20	83
47	476	8 x 10.5	1.0	20	92	10 x 10.5	0.7	13.4	111
100	107	10 x 10.5	0.7	13.4	151	12.5 x 13.5	0.23	3.5	550
220	227	12.5 x 13.5 (10 x 13.5)	0.14 (0.5)	2.1 (9.5)	750 (260)	16 x 16.5 (12.5 x 13.5)	0.15 (0.23)	2.3 (3.5)	850 (550)
330	337	12.5 x 13.5	0.14	2.1	750	16 x 16.5 (12.5 x 16)	0.15 (0.18)	2.3 (2.7)	850 (700)
470	477	16 x 16.5 (12.5 x 16)	0.10 (0.11)	1.5 (1.5)	1000 (900)	16 x 16.5	0.15	2.3	850
1000	108	18 x 16.5	0.10	1.5	1000				

WV Parameter μF		63				100			
		Case size ∅DxL (mm)	E.S.R. (Ω) 20°C	E.S.R. (Ω) -40°C	Ripple current (mA rms) at 125°C, 100KHz	Case size ∅DxL (mm)	E.S.R. (Ω) 20°C	E.S.R. (Ω) -40°C	Ripple current (mA rms) at 125°C, 100KHz
10	106	6.3 x 7.7	2.3	115	42	8 x 10.5	1.00	50	53
22	226	8 x 10.5	1.0	50	56	10 x 10.5	0.70	35	63
33	336	10 x 10.5	0.7	35	77	10 x 13.5	0.45	22.5	130
47	476	10 x 13.5	0.45	22.5	150	12.5 x 13.5	0.33	16.5	450
68	686					12.5 x 16	0.26	13	550
100	107	12.5 x 13.5	0.25	12.5	500	16 x 16.5	0.24	12	650
220	227	12.5 x 16	0.20	10	600				
330	337	16 x 16.5	0.18	9	820				



**DIMENSIONS & MAXIMUM PERMISSIBLE RIPPLE CURRENT**

WV Code μF	160		200		250		400		450	
	Size	Ripple current	Size	Ripple current	Size	Ripple current	Size	Ripple current	Size	Ripple current
3.3 335									12.5 × 16	65
4.7 475							12.5 × 13.5	70	16 × 16.5	85
6.8 685							16 × 16.5	100		
10 106	12.5 × 13.5	100	12.5 × 13.5	100	12.5 × 16	110				
22 226	16 × 16.5	180	16 × 16.5	180						

•Case size ØD×L(mm), ripple current (mA rms) at 125°C, 120Hz

**FREQUENCY COEFFICIENT OF ALLOWABLE RIPPLE CURRENT**

Frequency		50Hz	120Hz	1KHz	10KHz~	100KHz~
Coefficient	10~100V	10 ~ 100μF	0.35	0.40	0.75	1.00
		220 ~ 470μF	0.35	0.50	0.85	1.00
		680 ~ 2200μF	0.40	0.60	0.85	0.95

Frequency		50Hz	120Hz	300Hz	1KHz	10KHz	100KHz~
Coefficient	160~450V	0.75	1.00	1.25	1.50	1.75	1.80

The endurance of capacitors is reduced with internal heating produced by ripple current at the rate of halving the lifetime with every 5~10°C rise. When long life performance is required in actual use, the rms ripple current has to be reduced.

**◆ How to order**

<u>HKH</u>	<u>106</u>	<u>M</u>	<u>0035</u>	<u>0405</u>	<u>R</u>	<u>-</u>
↓	↓	↓	↓	↓	↓	↓
<u>Type</u>	<u>Capacitance code</u>	<u>Tolerance</u>	<u>Rated Voltage</u>	<u>Size Code</u>	<u>Package</u>	<u>Additional characters may be added for special requirements</u>
HKH	pF Code: 1st two digits represent significant figures 3rd digit represents multiplier (number of zeros to follow) 106 = 10uF 107 = 100uF	M: +/-20%	Code 0035: 35VDC For DC Voltage 0035: 35VDC 0100: 100VDC 0450: 450VDC	Code 0405: Size 4x5.8mm Size for V-chip E-cap 0405: Size 4x5.8mm 1010: Size 10x10.5mm 1816: Size 18x16.5mm	R: Tape & Reel	

Note: Specification is subject to change without further notice. For more details and updates, please visit our website.