

KH Series

High Reliability 高可靠品 适用于汽车电子装备
125°C and 5000 hours Suitable for Automotive Equipment

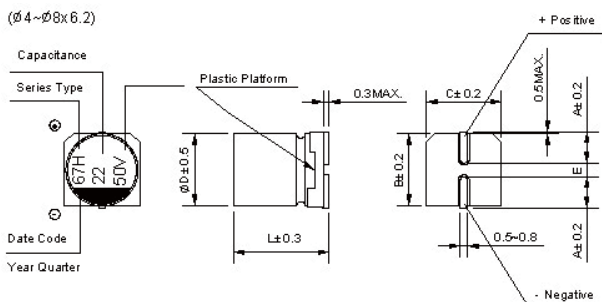


- Operating temperature from -40 ~ +125 C
使用温度范围: -40 ~ +125 C
- Load life from 1000 hours to 5000 hours
负荷寿命: 1000小时至5000小时
- Lead-free reflow soldering is available subject to customer's request
无铅回流焊接可按照客户的要求

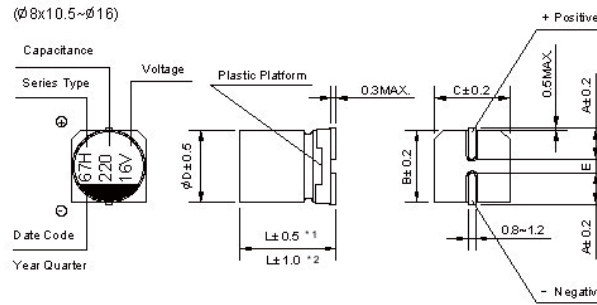
■ 主要技术性能 Specification

项目 Item	特性 Performance Characteristics																																																				
使用温度范围 Operating temperature range	-40 ~ +125 C																																																				
额定电压范围 Rated voltage range	10 ~ 450 V																																																				
静电容量范围 Capacitance Range	3.3~2200 μF																																																				
静电容量允许偏差 Capacitance Tolerance	±20% at 120 Hz, 20																																																				
漏电流 Leakage current	For 10V~100V, after 1 minutes's application of rated voltage, leakage current is not more than 0.03CV or 4(μA), whichever is greater. For 160V~450V, after 2 minutes application of rated voltage, leakage current is not more than 0.04CV+100(μA) 10V~100V; 施加额定工作电压2分钟, LC≤0.03CV或4(μA), 取较大值; 160V~450V; 施加额定工作电压2分钟, LC≤0.04CV+100(μA)																																																				
损耗角正切值 Tan δ	Measurement frequency 测试频率: 120Hz, Temperature 温度: 20°C <table border="1"> <tr> <td>Rated voltage(V.DC) 额定工作电压</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>160~250</td> </tr> <tr> <td>Tan δ</td> <td>Φ6.3~Φ10</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> <td>-</td> </tr> <tr> <td>损耗角正切(max)</td> <td>Φ12.5~Φ16</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> <td>0.24</td> </tr> </table>	Rated voltage(V.DC) 额定工作电压	10	16	25	35	50	63	100	160~250	160~250	Tan δ	Φ6.3~Φ10	0.24	0.20	0.16	0.14	0.14	0.18	0.18	-	-	损耗角正切(max)	Φ12.5~Φ16	0.22	0.18	0.16	0.14	0.12	0.14	0.10	0.20	0.24																				
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低温特性 Stability at Low Temperature	Measurement frequency 测试频率: 120Hz <table border="1"> <tr> <td>Rated voltage(V.DC) 额定工作电压</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>160~250</td> </tr> <tr> <td rowspan="4">Impedance ratio 阻抗比 XT/Z20(max)</td> <td rowspan="2">Φ6.3~Φ10</td> <td>Z(-25°C)/Z(-20°C)</td> <td>4</td> <td>3</td> <td>2</td> <td>2</td> <td>2</td> <td>2</td> <td>-</td> <td>-</td> </tr> <tr> <td>Z(-40°C)/Z(-20°C)</td> <td>10</td> <td>8</td> <td>6</td> <td>4</td> <td>4</td> <td>4</td> <td>4</td> <td>-</td> <td>-</td> </tr> <tr> <td rowspan="2">Φ12.5~Φ16</td> <td>Z(-25°C)/Z(-20°C)</td> <td>4</td> <td>3</td> <td>2</td> <td>2</td> <td>2</td> <td>2</td> <td>2</td> <td>3</td> <td>6</td> </tr> <tr> <td>Z(-40°C)/Z(-20°C)</td> <td>8</td> <td>6</td> <td>4</td> <td>3</td> <td>3</td> <td>3</td> <td>3</td> <td>6</td> <td>10</td> </tr> </table>	Rated voltage(V.DC) 额定工作电压	10	16	25	35	50	63	100	160~250	160~250	Impedance ratio 阻抗比 XT/Z20(max)	Φ6.3~Φ10	Z(-25°C)/Z(-20°C)	4	3	2	2	2	2	-	-	Z(-40°C)/Z(-20°C)	10	8	6	4	4	4	4	-	-	Φ12.5~Φ16	Z(-25°C)/Z(-20°C)	4	3	2	2	2	2	2	3	6	Z(-40°C)/Z(-20°C)	8	6	4	3	3	3	3	6	10
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		Z(-40°C)/Z(-20°C)	8	6	4	3	3	3	3	6	10																																										
高温负荷特性 Load Life	After 5000 hours application of rated voltage for Φ8×6.2~Φ6.3, as well as 2000hours application of rated voltage for Φ12.5~Φ16(160-450V) at 125 C, capacitances meet the characteristics requirements listed at right. 在125°C环境中施加额定工作电压5000小时于Φ12.5~Φ16(10~100V), 2000小时于Φ8×10.5~Φ10(10~100V), 1000小时于Φ8×6.2~Φ6.3, 以及施加额定工作电压2000小时于Φ12.5~Φ16(160~450V)后, 电容器的特性符合右表的要求。 <table border="1"> <tr> <td>Capacitance Change 静电容量变化率</td> <td>Within ±30% of the initial value 初始值±10%以内</td> </tr> <tr> <td>Tan δ 损耗角正切</td> <td>300% or less of the initial specified value 不大于规范值的300%</td> </tr> <tr> <td>Leakage Current 漏电流</td> <td>Initial specified value or less 不大于规范值</td> </tr> </table>	Capacitance Change 静电容量变化率	Within ±30% of the initial value 初始值±10%以内	Tan δ 损耗角正切	300% or less of the initial specified value 不大于规范值的300%	Leakage Current 漏电流	Initial specified value or less 不大于规范值																																														
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高温储存特性 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. 在125°C环境中无负荷放置1000小时后, 电容器的特性符合高温负荷特性中所列的规定值。																																																				
耐焊接热特性 Resistance to Soldering Heat	After reflow soldering and restored at room temperature, they meet the characteristics requirements listed at right. 经过回流焊并冷却至室温后, 电容器的特性符合右表的要求。 <table border="1"> <tr> <td>Capacitance Change 静电容量变化率</td> <td>Within ±10% of the initial value 初始值±10%以内</td> </tr> <tr> <td>Tan δ 损耗角正切</td> <td>Initial specified value or less 不大于规范值</td> </tr> <tr> <td>Leakage Current 漏电流</td> <td>Initial specified value or less 不大于规范值</td> </tr> </table>	Capacitance Change 静电容量变化率	Within ±10% of the initial value 初始值±10%以内	Tan δ 损耗角正切	Initial specified value or less 不大于规范值	Leakage Current 漏电流	Initial specified value or less 不大于规范值																																														
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适用标准 Applicable Standards	JIS C-5141 and JIS C-5102																																																				

■ 外形图及尺寸图 Case size table



KH Series



*1 [L±0.5] is applicable to $\Phi 8 \times 10.5 \sim \Phi 10$; *2 [L±1.0] is applicable to $\Phi 12.5 \sim \Phi 16$.

Re: Date code and series type — 1st digit for Year; 2nd digit for Quarter, 4 quarter codes in one year are 1, 4, 7, 0; 3rd character for Series; KH Series = H.

DXL	$\Phi 6.3 \times 5.8 / 7.7$	$\Phi 8 \times 6.2$	$\Phi 8 \times 10.5$	$\Phi 10 \times 10.5 / 13.5$	$\Phi 12.5 \times 13.5 / 16$	$\Phi 16 \times 16.5 / 21.5$
A	2.4	3.3	2.9	3.2	4.7	5.5
B	6.6	8.3	8.3	10.3	13.0	17.0
C	6.6	8.3	8.3	10.3	13.0	17.0
E±0.2	2.2	2.2	3.1	4.4	4.4	6.7
L	5.8 / 7.7	6.2	10.5	10.5 / 13.5	13.5 / 16	16.5 / 21.5

规格尺寸及最大允许纹波电流及ESR值 Standard size Maximum permissible ripple current&ESR

容量 Cap(uF)		WV电压				10				16				25			
		1A				1C				1E							
33	330													6.3×5.8	3.3	66	45
47	470									6.3×5.8	3.3	66	43	6.3×7.7 (8×6.2)	2.3 (2.3)	46 (46)	68 (68)
100	101	6.3×7.7 (8×6.2)	2.3 (2.3)	46 (46)	72 (72)	8×10.5	1.0	20	115	8×10.5	1.0	20	126				
220	221	8×10.5	1.0	20	136	10×10.5	0.7	13.4	175	10×10.5	0.7	13.4	211				
330	331	10×10.5	0.7	13.4	188	10×10.5	0.5	9.5	280	12.5×13.5 (10.5×13.5)	0.14 (0.5)	2.1 (9.5)	750 (270)				
470	471	10×13.5	0.5	9.5	300	12.5×13.5	0.14	2.1	750	12.5×13.5	0.14	2.1	750				
680	681					16×16.5 (12.5×13.5)	0.10 (0.14)	1.5 (2.1)	1000 (750)	16×16.5	0.10	1.5	1000	16×16.5	0.10	1.5	1000
1000	102	12.5×16 (12.5×13.5)	0.11 (0.14)	1.5 (2.1)	900 (750)	16×21.5	0.10	1.5	1200	16×21.5	0.10	1.5	1200				
2200	222	16×16.5 (16×21.5)	0.10 (0.10)	1.5 (1.5)	1000 (1200)	16×21.5	0.10	1.5	1200	Case Size	ESR(Ω) 20°C	ESR(Ω) -40°C	Ripples Current				

容量 Cap(uF)		WV电压				35				50			
		1A				1H							
10	100	6.3×5.8	3.3	66	38	6.3×7.7 (6.3×5.8)	2.3 (3.3)	46 (66)	50 (38)	6.3×7.7 (8×6.2)	2.3 (2.3)	46 (46)	50 (50)
22	220	6.3×5.8	3.3	66	39	6.3×7.7 (8×6.2)	2.3 (2.3)	46 (46)	50 (50)	8×10.5	1.0	20	83
33	330	6.3×7.7 (8×6.2)	2.3 (2.3)	46 (46)	62 (62)	8×10.5	1.0	20	83	10×10.5	0.7	13.4	111
47	470	8×10.5	1.0	20	92	10×10.5	0.7	13.4	111	12.5×13.5	0.23	3.5	550
100	101	10×10.5	0.7	13.4	151	16×16.5 (12.5×13.5)	0.15 (0.23)	2.3 (3.5)	850 (550)	16×16.5 (12.5×16)	0.15 (0.18)	2.3 (2.7)	850 (700)
220	221	12.5×13.5 (10×13.5)	0.14 (0.5)	2.1 (9.5)	750 (260)	16×21.5	0.15	2.3	920	16×21.5	0.15	2.3	920
330	331	12.5×13.5	0.14	2.1	750	Case Size	ESR(Ω) 20°C	ESR(Ω) -40°C	Ripples Current				
470	471	16×16.5 (12.5×16)	0.10 (0.11)	1.5 (1.5)	1000 (900)								
680	681	16.5×21.5	0.10	1.5	1200								

Ripple Current (mA ms) at 125 C 100kHz

KH Series

■ 规格尺寸及最大允许纹波电流及ESR值 Standard size Maximum permissible ripple current&ESR

WV电压		63				100			
容量 Cap(uF)		1J				2A			
10	100	6.3×7.7 (8×6.2)	2.3 3.3	115 (115)	42 (42)	8×10.5	1.00	50	53
22	220	8×10.5	1.0	50	56	10×10.5	0.70	35	63
33	330	10×10.5	0.7	35	77	10×13.5	0.45	22.5	130
47	470	10×13.5	0.45	22.5	150	12.5×13.5	0.33	16.5	450
68	680					12.5×16	0.26	13	550
100	101	12.5×13.5	0.25	12.5	500	16×16.5	0.24	12	650
220	221	12.5×16	0.20	10	600				
330	331	16×16.5	0.18	9	820	Case Size	ESR(Ω) 20℃	ESR(Ω) -40℃	Ripples Current
470	471	16.5×21.5	0.11	5.5	1100				

Ripple Current (mA ms) at 125℃ 100kHz

■ 规格尺寸及最大允许纹波电流 Standard size Maximum permissible ripple current

WV电压		160		200		250		400		450	
容量 Cap(uF)		2C		2D		2E		2G		2W	
3.3	3R3									12.5×16	65
4.7	4R7							12.5×13.5	70	16×21.5	85
6.8	6R8							16×16.5	100		
10	100	12.5×13.5	100	12.5×13.5	100	12.5×16	110	16×21.5	140		
22	220	16×16.5	180	16×16.5	180	16×21.5	205				
33	330	16×21.5	245	16×21.5	250					Case Size	Ripples Current

Ripple Current (mA ms) at 125℃ 100kHz

■ 纹波电流频率补偿系数 (10~100V) Standard size Maximum permissible ripple current

Frequency	50Hz	120Hz	1kHz	10kHz	100kHz~
10~100	0.35	0.40	0.75	0.90	1.00
220~470	0.35	0.50	0.85	0.94	1.00
680~2200	0.40	0.60	0.85	0.95	1.00

■ 纹波电流频率补偿系数 (10~100V) Standard size Maximum permissible ripple current

Frequency	50Hz	120Hz	300Hz	1kHz	10kHz	100kHz~
Coefficient	0.75	1.00	1.25	1.50	1.75	1.80

KH Parts List (1)

Size D x L	Part No.	R.V. (V.DC)	Cap. (μ F)	Tangent of Loss Angle ($\tan \delta$)	Leakage Current (μ A)	ESR (Ω) (20 $^{\circ}$ C, 100kHz)	ESR (Ω) (-40 $^{\circ}$ C, 100kHz)	Ripple Current (mA rms.) (100kHz,125 $^{\circ}$ C)
				max.	max.	max.	max.	max.
6.3x7.7	10kH101MLC6.3x7.7EC	10	100	0.24	30.0	2.3	46.0	72
8x6.2	10kH101MLC8x6.2EC	10	100	0.24	30.0	2.3	46.0	72
8x10.5	10kH221MLC8x6.2EC	10	220	0.24	66.0	1.0	20.0	136
10x10.5	10kH331MLC10x10.5EC	10	330	0.24	99.0	0.7	13.4	188
10x13.5	10kH471MLC10x13.5EC	10	470	0.24	141.0	0.5	9.5	300
12.5x13.5	10kH102MLC12.5x13.5EC	10	1000	0.22	300.0	0.14	2.1	750
12.5x16	10kH102MLC12.5x16EC	10	1000	0.22	300.0	0.11	1.5	900
16x16.5	10kH222MLC16x16.5EC	10	2200	0.22	660.0	0.10	1.5	1000
16x21.5	10kH222MLC16x21.5EC	10	2200	0.22	660.0	0.10	1.5	1200
6.3x5.8	16kH470MLC6.3x5.8EC	16	47	0.20	22.6	3.3	66.0	43
8x10.5	16kH101MLC8x10.5EC	16	100	0.20	48.0	1.0	20.0	115
10x10.5	16kH221MLC10x10.5EC	16	220	0.20	105.6	0.7	13.4	175
10x13.5	16kH331MLC10x13.5EC	16	330	0.20	158.4	0.5	9.5	280
12.5x13.5	10kH471MLC12.5x13.5EC	16	470	0.18	225.6	0.14	2.1	750
16x16.5	16kH681MLC16x16.5EC	16	680	0.18	326.4	0.14	2.1	750
12.5x13.5	16kH681MLC12.5x13.5EC	16	680	0.18	326.4	0.10	1.5	1000
16x21.5	16kH102MLC16x21.5EC	16	1000	0.18	480.0	0.10	1.5	1200
16x21.5	16kH222MLC16x21.5EC	16	2200	0.18	1056.0	0.10	1.5	1200
6.3x5.8	25kH330MLC6.3x5.8EC	25	33	0.16	24.8	3.3	66.0	45
6.3x7.7	25kH470MLC6.3x7.7EC	25	47	0.16	35.3	2.3	46.0	68
8x6.2	25kH470MLC8x6.2EC	25	47	0.16	35.3	2.3	46.0	68
8x10.5	25kH101MLC8x10.5EC	25	100	0.16	75.0	1.0	20.0	126
10x10.5	25kH221MLC10x10.5EC	25	220	0.16	165.0	0.7	13.4	211
10x13.5	25kH331MLC10x13.5EC	25	330	0.16	247.5	0.50	9.5	270
12.5x13.5	25kH331MLC12.5x13.5EC	25	330	0.16	247.5	0.14	2.1	750
12.5x13.5	25kH471MLC12.5x13.5EC	25	470	0.16	325.5	0.14	2.1	750
16x16.5	25kH681MLC16x16.5EC	25	680	0.16	510.0	0.10	1.5	1000
16x21.5	25kH681MLC16x21.5EC	25	680	0.16	510.0	0.10	1.5	1200
16x21.5	25kH102MLC16x21.5EC	25	1000	0.16	750.0	0.10	1.5	1200
6.3x5.8	35kH100MLC6.3x5.8EC	35	10	0.14	10.5	3.3	66.0	38
6.3x5.8	35kH220MLC6.3x5.8EC	35	22	0.14	23.1	3.3	66.0	39
6.3x7.7	35kH330MLC6.3x7.7EC	35	33	0.14	34.7	2.3	46.0	62
8x6.2	35kH330MLC8x6.2EC	35	33	0.14	34.7	2.3	46.0	62
8x10.5	35kH470MLC8x10.5EC	35	47	0.14	49.4	1.0	20.0	92
10x10.5	35kH101MLC10x10.5EC	35	100	0.14	105.0	0.7	13.4	151
10x13.5	35kH221MLC10x13.5EC	35	220	0.14	247.5	0.50	9.5	260
12.5x13.5	35kH221MLC12.5x13.5EC	35	220	0.14	247.5	0.14	2.1	750
12.5x13.5	35kH331MLC12.5x13.5EC	35	330	0.14	231.0	0.14	2.1	750
16x16.5	35kH471MLC16x16.5EC	35	470	0.14	346.5	0.11	1.5	900
16x21.5	35kH471MLC16x21.5EC	35	470	0.14	493.5	0.10	1.5	1000
16x21.5	35kH681MLC16x21.5EC	35	680	0.14	714.0	0.10	1.5	1200
6.3x5.8	50kH100MLC6.3x5.8EC	50	10	0.14	15.0	3.3	66.0	38
6.3x7.7	50kH100MLC6.3x7.7EC	50	10	0.14	15.0	2.3	46.0	50

KH Parts List (2)

Size	Part No.	R.V. (V.DC)	Cap. (μ F)	Tangent of Loss Angle ($\tan \delta$)	Leakage Current (μ A)	ESR (Ω) (20 $^{\circ}$ C, 100kHz)	ESR (Ω) (-40 $^{\circ}$ C, 100kHz)	Ripple Current (mA rms.) (100kHz,125 $^{\circ}$ C)
D x L				max.	max.	max.	max.	max.
6.3x7.7	50kH220MLC6.3x7.7EC	50	22	0.14	33.0	2.3	46.0	50
8x6.2	50kH220MLC8x6.2EC	50	22	0.14	33.0	2.3	46.0	50
8x10.5	50kH330MLC8x10.5EC	50	33	0.14	49.5	1.0	20.0	83
10x10.5	50kH470MLC10x10.5EC	50	47	0.14	70.5	0.7	13.4	111
12.5x13.5	50kH101MLC12.5x13.5EC	50	100	0.12	150.0	0.23	3.5	550
12.5x13.5	50kH221MLC12.5x13.5EC	50	220	0.12	300.0	0.23	3.5	550
16x16.5	50kH221MLC16x16.5EC	50	220	0.12	300.0	0.15	2.3	850
12.5x16	50kH331MLC12.5x16EC	50	330	0.12	495.0	0.18	2.7	700
16x16.5	50kH331MLC16x16.5EC	50	330	0.12	495.0	0.15	2.3	850
16x21.5	50kH471MLC16x21.5EC	50	470	0.12	705.0	0.15	2.3	920
6.3x7.7	63kH100MLC8x10.5EC	63	10	0.18	18.9	2.3	115.0	42
8x6.2	63kH100MLC10x10.5EC	63	10	0.18	18.9	2.3	115.0	42
8x10.5	63kH220MLC10x13.5EC	63	22	0.18	41.6	1.0	50.0	56
10x10.5	63kH330MLC12.5x13.5EC	63	33	0.18	62.4	0.7	35.0	77
10x13.5	63kH470MLC16x16.5EC	63	47	0.18	88.8	0.45	22.5	150
12.5x13.5	63kH101MLC12.5x13.5EC	63	100	0.14	189.0	0.25	12.5	500
12.5x16	63kH221MLC16x21.5EC	63	220	0.14	415.8	0.20	10.0	600
16x16.5	63kH331MLC16x21.5EC	63	330	0.14	623.7	0.18	9.0	820
16x21.5	63kH471MLC16x21.5EC	63	470	0.14	888.3	0.11	5.5	1100
8x10.5	100kH100MLC8x10.5EC	100	10	0.18	30	1.00	50.0	53
10x10.2	100kH220MLC10x10.2EC	100	22	0.18	66	0.70	35.0	63
10x13.5	25kH330MLC10x13.5EC	100	33	0.18	99.0	0.45	22.5	130
12.5x13.5	25kH470MLC12.5x13.5EC	100	47	0.10	141.0	0.33	16.5	450
12.5x16	25kH680MLC12.5x16EC	100	68	0.10	204.5	0.26	13.0	550
16x16.5	25kH101MLC16x16.5EC	100	100	0.10	300.5	0.24	12.0	650

KH Parts List (3)

Size	Part No.	R.V. (V.DC)	Cap. (μF)	Tangent of Loss Angle ($\tan \delta$)	Leakage Current (μA)	Ripple Current (mA rms.) (100kHz, 125°C)
D x L				max.	max.	max.
12.5×13.5	160KH101MLC12.5×13.5EC	160	10	0.20	164	100
16×16.5	160KH220MLC16×16.5EC	160	22	0.20	241	180
16×21.5	160KH330MLC16×21.5EC	160	33	0.20	311	245
12.5×13.5	200KH100MLC12.5×13.5EC	200	10	0.20	180	100
16×16.5	200KH220MLC16×16.5EC	200	22	0.20	276	180
16×21.5	200KH330MLC16×21.5EC	200	33	0.20	364	245
12.5×16	250KH100MLC12.5×16EC	250	10	0.20	200	110
16×21.5	250KH220MLC16×21.5EC	250	22	0.20	320	205
12.5×13.5	400KH4R7MLC12.5×13.5EC	400	4.7	0.24	175	70
16×16.5	400KH6R8MLC16×16.5EC	400	6.8	0.24	209	100
16×21.5	400KH100MLC16×21.5EC	400	10	0.24	260	140
12.5×16	450KH3R3MLC12.5×16EC	450	3.3	0.24	159	65
16×16.5	450KH4R7MLC16×16.5EC	450	4.7	0.24	185	85