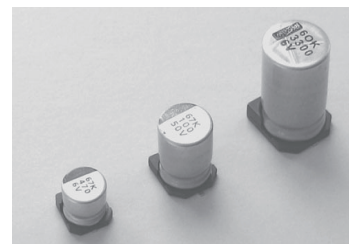


KL Series

3000~5000 Hours Load Life 3000~5000小时长寿命品

- Load life of 5000 hours with temperature up to +105°C
在温度高至+105°C环境下, 负荷寿命可达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

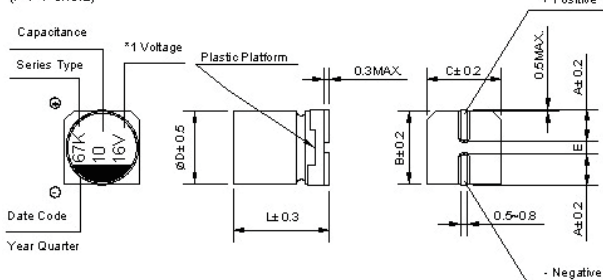


主要技术性能 Specification

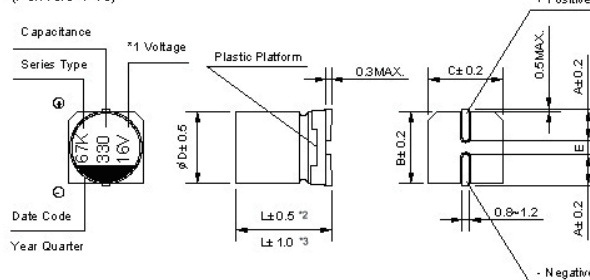
项目 Item	特性 Performance Characteristics																																																						
使用温度范围 Operating temperature rang	-55 ~ +105 ℃																																																						
额定电压范围 Rated voltage range	6.3 ~ 100 V																																																						
静电容量范围 Capacitance Range	0.1~470 μF																																																						
静电容量允许偏差Capacitance Tolerance	± 20% (120Hz, +20℃)																																																						
漏电流 Leakage current	For Φ4 ~ Φ10,after 2 minutes's application of rated voltage,leakagecurrent is not more than 0.01CV or 3(μA),whichever is greater.For Φ12.5 ~ Φ16,after 1 minutes application of rated voltage,leakage current is not more than 0.03CV or 4(μA), whichever is greater. Φ4 ~ Φ10; 施加额定工作电压2分钟, LC≤0. 01CV或3 (μA),取较大值; Φ12.5 ~ Φ16; 施加额定工作电压1分钟, LC≤0. 03CV或4 (μA),取较大值。																																																						
损耗角正切值 Tan δ	Measurement frequency 测试频率: 120Hz, Temperature 温度: 20℃ <table><tr><td colspan="2">Rated voltage(V.DC) 额定工作电压</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td><td>63</td><td>100</td></tr><tr><td>Tan δ</td><td>Φ4~Φ10</td><td>0.28</td><td>0.24</td><td>0.20</td><td>0.13</td><td>0.13</td><td>0.12</td><td>0.12</td><td>0.12</td></tr><tr><td>损耗角正切 (max)</td><td>Φ12.5~Φ16</td><td>0.38</td><td>0.34</td><td>0.30</td><td>0.22</td><td>0.22</td><td>0.18</td><td>0.18</td><td>0.18</td></tr></table>										Rated voltage(V.DC) 额定工作电压		6.3	10	16	25	35	50	63	100	Tan δ	Φ4~Φ10	0.28	0.24	0.20	0.13	0.13	0.12	0.12	0.12	损耗角正切 (max)	Φ12.5~Φ16	0.38	0.34	0.30	0.22	0.22	0.18	0.18	0.18															
Rated voltage(V.DC) 额定工作电压		6.3	10	16	25	35	50	63	100																																														
Tan δ	Φ4~Φ10	0.28	0.24	0.20	0.13	0.13	0.12	0.12	0.12																																														
损耗角正切 (max)	Φ12.5~Φ16	0.38	0.34	0.30	0.22	0.22	0.18	0.18	0.18																																														
低温特性 Stability at Low Temperature	Measurement frequency 测试频率: 120Hz <table><tr><td colspan="2">Rated voltage(V.DC) 额定工作电压</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td><td>63</td><td>100</td></tr><tr><td rowspan="4">Impedance ratio 阻抗比 XT/Z20(max)</td><td rowspan="2">Φ4~Φ10</td><td>Z(-25℃)/Z(20℃)</td><td>4</td><td>3</td><td>2</td><td>2</td><td>2</td><td>2</td><td>2</td></tr><tr><td>Z(-55℃)/Z(20℃)</td><td>10</td><td>7</td><td>5</td><td>3</td><td>3</td><td>3</td><td>3</td></tr><tr><td rowspan="2">Φ12.5~Φ16</td><td>Z(-25℃)/Z(20℃)</td><td>5</td><td>4</td><td>3</td><td>2</td><td>2</td><td>2</td><td>2</td></tr><tr><td>Z(-55℃)/Z(20℃)</td><td>12</td><td>10</td><td>8</td><td>5</td><td>4</td><td>3</td><td>3</td></tr></table>										Rated voltage(V.DC) 额定工作电压		6.3	10	16	25	35	50	63	100	Impedance ratio 阻抗比 XT/Z20(max)	Φ4~Φ10	Z(-25℃)/Z(20℃)	4	3	2	2	2	2	2	Z(-55℃)/Z(20℃)	10	7	5	3	3	3	3	Φ12.5~Φ16	Z(-25℃)/Z(20℃)	5	4	3	2	2	2	2	Z(-55℃)/Z(20℃)	12	10	8	5	4	3	3
Rated voltage(V.DC) 额定工作电压		6.3	10	16	25	35	50	63	100																																														
Impedance ratio 阻抗比 XT/Z20(max)	Φ4~Φ10	Z(-25℃)/Z(20℃)	4	3	2	2	2	2	2																																														
		Z(-55℃)/Z(20℃)	10	7	5	3	3	3	3																																														
	Φ12.5~Φ16	Z(-25℃)/Z(20℃)	5	4	3	2	2	2	2																																														
		Z(-55℃)/Z(20℃)	12	10	8	5	4	3	3																																														
高温负荷特性 Load Life	After 5000 hours (3000 hours for Φ4~Φ6.3 and Φ8×6.2) application of rated voltage at 105 ℃, capacitions meet the characteristics requirements listed at right. 在105℃环境中施加额定工作电压5000小时, 电容器的特性符合右表的要求。		Capacitance Change 静电容量变化率		Within ±30% of the initial value 初始值±30%以内																																																		
			Tan δ 损耗角正切		300% or less of the initial specified value 初始值的±30%以内																																																		
			Leakage Current 漏电流		Initial specified value or less不大于规范值																																																		
高温储存特性 Shelf Life	After leaving capacitors under no load at 105 ℃ for 1000 hours, they meet the specified value for load life characteristics listed above. 在105℃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。		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																																																		
适用标准 Applicable Standards	IEC-60384-18																																																						

外形图及尺寸图 Case size table

(Φ4~Φ8×6.2)



(Φ8×10.5~Φ16)



*1 Voltage mark [6V] represents 6.3V for Φ4~Φ10; *2 [L±0.5] is applicable to Φ8×10.5~Φ10; *3 [L±1.0] is applicable to Φ12.5~Φ16. 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; KL Series = K.

KL Series

(mm)								
DXL	Φ4X5.8	Φ5X8	Φ6.3X5.8 / 7.7	Φ8X6.2	Φ8X10.5	Φ10X10.5 / 13.5	Φ12.5X13.5 / 16	Φ16X16.5 / 21.5
A	1.8	2.1	2.4	3.3	2.9	4.7	4.7	5.5
B	4.3	5.3	6.6	8.3	8.3	13.0	13.0	17.0
C	4.3	5.3	6.6	8.3	8.3	13.0	13.0	17.0
E±0.2	1.0	1.3	2.2	2.2	3.1	4.4	4.4	6.7
L	5.8	5.8	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		6.3		10		16		25	
		0J		1A		1C		1E	
10	100					4×5.8	18	5×5.8	27
22	220	4×5.8	22	5×5.8	30	5×5.8	30	6.3×5.8	44
33	330	5×5.8	35	5×5.8	36	6.3×5.8	48	6.3×5.8	50
47	470	5×5.8	38	6.3×5.8	50	6.3×5.8	50	6.3×7.7 (8×6.2)	63 (63)
100	101	6.3×5.8	69	6.3×7.7 (8×6.2)	81 (81)	6.3×7.7 (8×6.2)	81 (81)	8×10.5	116
150	151	6.3×7.7 (8×6.2)	85 (85)	8×10.5	125	8×10.5	125	8×10.5	320
220	221	6.3×7.7 (8×6.2)	120 (12)	8×10.5	141	10×10.5	216	10×10.5	320
330	331	8×10.5	290	10×10.5	290	10×10.5	290	10×10.5	320
470	471	10×10.5	320	10×10.5	320	10×10.5	320	12.5×13.5 (10×13.5)	400 (350)
680	681	10×10.5	320	10×10.5	320	10×13.5	420	12.5×13.5	415
1000	102	10×10.5	410	10×13.5	390	12.5×13.5	550	12.5×13.5	460
1500	152	10×13.5	450	12.5×13.5	480	12.5×13.5	650	12.5×16	700
2200	222	12.5×13.5	680	12.5×16 (12.5×13.5)	750 (510)	16×16.5	800	16×21.5	1000
3300	332	12.5×16 (12.5×13.5)	850 (800)	16×16.5	800	16×21.5	1000		Ripples Current
4700	472	16×21.5	1500	16×21.5	1100			Case Size	

Ripple Current (mA ms) at 105℃ 120Hz

KL Series

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

容量 Cap(uF) WV电压		35		50		63		100	
		1V		1H		1J		2A	
0.1	0R1			4×5.8	1.0				
0.22	R22			4×5.8	2.6				
0.33	R33			4×5.8	3.2				
0.47	R47			4×5.8	5				
1	010			4×5.8	6				
22	2R2			4×5.8	12				
3.3	3R3			4×5.8	17			6.3×7.7 (8×6.2)	30 (30)
4.7	4R7	4×5.8	16	5×5.8	22			8×10.5	50
10	100	5×5.8	27	6.3×5.8	32	6.3×7.7 (8×6.2)	45 (45)	8×10.5	55
22	220	6.3×5.8	44	6.3×7.7 (8×6.2)		8×10.5	65	10×10.5	70
33	330	6.3×7.7 (8×6.2)		8×10.5	140	10×10.5	80	10×10.5	80
47	470	8×10.5	92	10×10.5	310	10×10.5	90	12.5×13.5 (10×13.5)	250 (150)
68	680							12×13.5	300
100	101	10×10.5	151	10×10.5	310	10×13.5	150	16×16.5 (12.5×16) (12.5×13.5)	600 (420) (380)
150	151	10×10.5	290	10×10.5	310				
220	221	10×10.5	375		340 (320)	12×13.5	470	16×21.5	800
330	331	12×13.5 (10×13.5)	380 (375)	12.5×16 (12.5×13.5)	600 (500)	16×16.5 (12.5×16)	650 (550)		
470	471	12×13.5	520	16×16.5	700	16×21.5	850		
680	681	12×13.5	550						
1000	102	16×16.5 (12.5×16)	750 (600)	16×21.5	950				
2200	222	16×21.5	1350					Case Size	Ripples Current

Ripple Current (mA.ms) at 105℃ 120Hz

纹波电流频率补偿系数 Frequency Coefficient Factor of Rated Ripple Current

Frequency Capacitance(uF)		50Hz	120Hz	300Hz	1kHz	10kHz~
Φ4~Φ10		0.70	1.00	1.17	1.36	1.50
Φ12.5~Φ16	~68	0.75	1.00	1.35	1.57	2.00
	100~470	0.80	1.00	1.23	1.34	1.50
	680~4700	0.85	1.00	1.10	1.13	1.15

KL Parts List (1)

Size	Part No.	R.V. (V.DC)	Cap. (μF)	Tangent of Loss Angle ($\tan \delta$)	Leakage Current (μA)	ESR (Ω) (20 $^{\circ}C$, 120kHz)	Ripple Current (mA rms.) (120kHz, 105 $^{\circ}C$)
D × L				max.	max.	max.	max.
4×5.8	6.3KL220MLC4×5.8EC	6.3	22	0.28	3.0	27.4	22
5×5.8	6.3KL330MLC5×5.8EC	6.3	33	0.28	3.0	18.3	35
5×5.8	6.3KL470MLC5×5.8EC	6.3	47	0.28	3.0	12.8	38
6.3×5.8	6.3KL101MLC6.3×5.8EC	6.3	100	0.28	6.3	6.0	69
6.3×7.7	6.3KL151MLC6.3×7.7EC	6.3	150	0.28	9.5	4.0	85
8×6.2	6.3KL151MLC8×6.2EC	6.3	150	0.28	9.5	4.0	85
6.3×7.7	6.3KL221MLC6.3×7.7EC	6.3	220	0.28	13.9	2.7	120
8×6.2	6.3KL221MLC8×6.2EC	6.3	220	0.28	13.9	2.7	120
8×10.5	6.3KL331MLC8×10.5EC	6.3	330	0.28	20.8	1.8	290
10×10.5	6.3KL471MLC10×10.5EC	6.3	470	0.28	29.6	1.3	320
10×10.5	6.3KL681MLC10×10.5EC	6.3	680	0.28	42.8	0.9	320
10×10.5	6.3KL102MLC10×10.5EC	6.3	1000	0.28	63.0	0.6	410
10×10.5	6.3KL152MLC10×10.5EC	6.3	1500	0.28	94.5	0.4	450
10×13.5	6.3KL222MLC10×13.5EC	6.3	2200	0.38	415.5	0.37	680
12.5×13.5	6.3KL332MLC12.5×13.5EC	6.3	3300	0.38	623.7	0.25	800
12.5×16	6.3KL332MLC12.5×16EC	6.3	3300	0.38	623.7	0.25	850
16×21.5	6.3KL472MLC16×21.5EC	6.3	4700	0.38	888.3	0.17	1500
5×5.8	10KL220MLC5×5.8EC	10	22	0.24	3.0	23.5	30
5×5.8	10KL330MLC5×5.8EC	10	33	0.24	3.3	15.7	36
6.3×5.8	10KL470MLC6.3×5.8EC	10	47	0.24	4.7	11.0	50
6.3×7.7	10KL101MLC6.3×7.7EC	10	100	0.24	10.0	5.2	81
8×6.2	10KL101MLC8×6.2EC	10	150	0.24	10.0	5.2	81
8×10.5	10KL151MLC8×10.5EC	10	220	0.24	15.0	3.5	125
8×10.5	10KL221MLC8×10.5EC	10	220	0.24	22.0	2.4	141
10×10.5	10KL331MLC10×10.5EC	10	330	0.24	33.0	1.6	290
10×10.5	10KL471MLC10×10.5EC	10	470	0.24	47.0	1.1	320
10×10.5	10KL681MLC10×10.5EC	10	680	0.24	68.0	0.8	320
10×13.5	10KL102MLC10×13.5EC	10	1000	0.24	100.0	0.5	390
12.5×13.5	10KL1521MLC12.5×13.5EC	10	1500	0.34	450.0	0.49	480
12.5×13.5	10KL222MLC12.5×13.5EC	10	2200	0.34	660.0	0.33	510
12.5×16	10KL222MLC12.5×16EC	10	2200	0.34	660.0	0.33	750
16×16.5	10KL332MLC16×16.5EC	10	3300	0.34	990.0	0.22	8000
16×21.5	10KL472MLC16×21.5EC	10	4700	0.34	1410.0	0.16	1100
4×5.8	16KL100MLC4×5.8EC	16	10	0.20	3.0	43.1	18
5×5.8	16KL220MLC5×5.8EC	16	22	0.20	3.5	19.6	30
6.3×5.8	16KL330MLC6.3×5.8EC	16	33	0.20	5.3	13.1	48
6.3×5.8	16KL470MLC6.3×5.8EC	16	47	0.20	7.5	9.2	50
6.3×7.7	16KL101MLC6.3×7.7EC	16	100	0.20	16.0	4.3	81
8×6.2	16KL101MLC8×6.2EC	16	100	0.20	16.0	4.3	81
8×10.5	16KL151MLC8×10.5EC	16	150	0.20	24.0	2.9	125
10×10.5	16KL221MLC10×10.5EC	16	220	0.20	35.2	2.0	216
10×10.5	16KL331MLC10×10.5EC	16	330	0.20	52.8	1.3	290
10×10.5	16KL471MLC10×10.5EC	16	470	0.20	72.5	0.9	320
10×13.5	16KL681MLC10×13.5EC	16	680	0.20	108.8	0.6	420
12.5×13.5	16KL102MLC12.5×13.5EC	16	1000	0.20	480	0.65	550

KL Parts List (2)

Size	Part No.	R.V. (V.DC)	Cap. (μF)	Tangent of Loss Angle ($\tan \delta$)	Leakage Current (μA)	ESR (Ω) (20°C, 120kHz)	Ripple Current (mA rms.) (120kHz, 105°C)
D × L				max.	max.	max.	max.
12.5×13.5	16KL152MLC4×5.8EC	16	1500	0.30	720.0	0.43	650
16×16.5	16KL22MLC5×5.8EC	16	2200	0.30	1056.0	0.29	800
16×21.5	16KL323MLC5×5.8EC	16	3300	0.30	1584.0	0.20	1000
5×5.8	25KL100MLC5×5.8EC	25	10	0.16	3.0	34.5	27
6.3×5.8	25KL220MLC6.3×5.8EC	25	22	0.16	5.5	15.7	44
6.3×5.8	25KL330MLC6.3×7.7EC	25	33	0.16	8.3	10.5	50
6.3×7.7	25KL470MLC8×6.2EC	25	47	0.16	11.8	7.3	63
8×6.2	25KL470MLC8×10.5EC	25	47	0.16	11.8	7.3	63
8×10.5	25KL101MLC10×10.5EC	25	100	0.16	25.0	3.5	116
10×10.5	25KL151MLC10×10.5EC	25	150	0.16	37.5	2.3	320
10×10.5	25KL221MLC10×10.5EC	25	220	0.16	55.0	1.6	320
10×10.5	25KL331MLC10×10.5EC	25	330	0.16	82.5	1.0	320
10×13.5	25KL471MLC10×13.5EC	25	470	0.16	117.5	0.7	350
12.5×13.5	25KL471MLC10×13.5EC	25	470	0.26	352.5	1.2	400
12.5×13.5	25KL681MLC12.5×13.5EC	25	680	0.26	510.0	0.82	415
12.5×13.5	25KL102MLC12.5×16EC	25	1000	0.26	750.0	0.56	460
12.5×16	25KL152MLC16×21.5EC	25	1500	0.26	1125.0	0.37	700
16×21.5	25KL222MLC16×21.5EC	25	2200	0.26	1650.0	0.25	1000
4×5.8	35KL4R7MLC4×5.8EC	35	4.7	0.13	3.0	56.94	16
5×5.8	35KL100MLC5×5.8EC	35	10	0.13	3.5	28.03	27
6.3×5.8	35KL220MLC6.3×5.8EC	35	22	0.13	7.7	12.7	44
6.3×7.7	35KL330MLC6.3×7.7EC	35	33	0.13	11.6	8.5	57
8×6.2	35KL330MLC8×6.2EC	35	33	0.13	11.6	8.5	57
8×10.5	35KL470MLC8×10.5EC	35	47	0.13	16.5	6.0	92
10×10.5	35KL101MLC10×10.5EC	35	100	0.13	35.0	2.8	151
10×10.5	35KL151MLC10×10.5EC	35	150	0.13	52.5	1.9	290
10×10.5	35KL221MLC10×10.5EC	35	220	0.13	77.0	1.3	375
10×13.5	35KL331MLC10×13.5EC	35	330	0.13	115.5	0.8	375
12.5×13.5	35KL331MLC12.5×13.5EC	35	330	0.22	364.5	1.44	380
12.5×13.5	35KL471MLC12.5×13.5EC	35	470	0.22	493.5	1.01	520
12.5×13.5	35KL681MLC12.5×13.5EC	35	680	0.22	714.0	0.70	550
12.5×16	35KL102MLC12.5×16EC	35	1000	0.22	1050.0	0.47	600
16×16.5	35KL102MLC16×16.5EC	35	1000	0.22	1050.0	0.47	750
16×21.5	35KL222MLC16×21.5EC	35	2200	0.22	2310.0	0.22	1350
4×5.8	50KL0R1MLC4×5.8EC	50	0.1	0.12	3.0	2587.6	1
4×5.8	50KL22MLC4×5.8EC	50	0.22	0.12	3.0	1176.2	2.6
4×5.8	50KL33MLC4×5.8EC	50	0.33	0.12	3.0	784.1	3.2
4×5.8	50KL47MLC4×5.8EC	50	0.47	0.12	3.0	550.5	5
4×5.8	50KL010MLC4×5.8EC	50	1	0.12	3.0	258.8	8
4×5.8	50KL2R2MLC4×5.8EC	50	2.2	0.12	3.0	117.6	12
4×5.8	50KL3R3MLC4×5.8EC	50	3.3	0.12	3.0	78.4	17
5×5.8	50KL4R7MLC5×5.8EC	50	4.7	0.12	3.0	55.1	22
6.3×5.8	50KL100MLC6.3×5.8EC	50	10	0.12	5.0	25.9	32
6.3×7.7	50KL220MLC6.3×7.7EC	50	22	0.12	11.0	11.8	58

KL 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 × L				max.	max.	max.
8×6.2	50KL220MLC8×6.2EC	50	22	0.12	11.0	58
8×10.5	50KL330MLC8×10.5EC	50	33	0.12	16.5	140
10×10.5	50KL470MLC10×10.5EC	50	47	0.12	23.5	310
10×10.5	50KL101MLC10×10.5EC	50	100	0.12	50.0	310
10×10.5	50KL151MLC10×10.5EC	50	150	0.12	75.0	310
10×13.5	50KL221MLC10×13.5EC	50	220	0.12	110.0	320
12.5×13.5	50KL221MLC12.5×13.5EC	50	220	0.18	330.0	340
12.5×13.5	50KL331MLC12.5×13.5EC	50	330	0.18	495.0	500
12.5×16	50KL331MLC12.5×16EC	50	330	0.18	495.0	600
16×16.5	50KL471MLC16×21.5EC	50	470	0.18	705.0	700
16×21.5	50KL102MLC16×21.5EC	50	1000	0.18	1500.0	950
6.3×7.7	63KL100MLC6.3×7.7EC	63	10	0.12	6.3	45
8×6.2	63KL100MLC8×6.2EC	63	10	0.12	6.3	45
8×10.5	63KL220MLC8×10.5EC	63	22	0.12	13.9	65
10×10.5	63KL330MLC10×10.5EC	63	33	0.12	20.8	80
10×10.5	63KL470MLC10×10.5EC	63	47	0.12	29.6	90
10×10.5	63KL101MLC10×10.5EC	63	100	0.12	63.0	150
12.5×13.5	63KL221MLC12.5×13.5EC	63	220	0.12	415.8	470
12.5×16	63KL331MLC12.5×16EC	63	330	0.12	623.7	550
16×16.5	63KL331MLC16×16.5EC	63	330	0.12	623.7	650
16×21.5	63KL471MLC16×21.5EC	63	470	0.12	888.3	850
6.3×7.7	100KL3R3MLC6.3×7.7EC	100	3.3	0.12	78.4	30
8×6.2	100KL3R3MLC8×6.2EC	100	3.3	0.12	78.4	30
8×10.5	100KL4R7MLC8×10.5EC	100	4.7	0.12	55.1	50
8×10.5	100KL100MLC8×10.5EC	100	10	0.12	25.9	55
10×10.5	100KL220MLC10×10.5EC	100	22	0.12	11.8	70
10×10.5	100KL330MLC10×10.5EC	100	33	0.12	7.8	80
10×13.5	100KL470MLC10×13.5EC	100	47	0.12	5.5	150
12.5×13.5	100KL470MLC12.5×13.5EC	100	47	0.18	8.3	250
12.5×13.5	100KL680MLC12.5×13.5EC	100	68	0.18	5.7	300
12.5×13.5	100KL101MLC12.5×13.5EC	100	100	0.18	3.9	380
12.5×16	100KL101MLC12.5×16EC	100	100	0.18	3.9	420
16×16.5	100KL101MLC16×16.5EC	100	100	0.18	3.9	600
16×21.5	100KL221MLC16×21.5EC	100	220	0.18	1.8	800