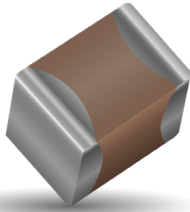


Automotive MLCC, KAM Series

General Specifications



GENERAL DESCRIPTION

KYOCERA AVX has supported the Automotive Industry requirements for Multilayer Ceramic Capacitors consistently for more than 25 years. Products have been developed and tested specifically for automotive applications and all manufacturing facilities are QS9000 and VDA 6.4 approved.

KYOCERA AVX is using AECQ200 as the qualification vehicle for this transition. A detailed qualification package is available on request and contains results on a range of part numbers.

The KAM series are plated with a Nickel/Tin finish. For FLEXITERM® please refer to the KAF series datasheet.

HOW TO ORDER

KAM	31	G	R7	1H	475	K	U
Series AEC-Q200 Tin Nickel Finish	Size 03 = 0201 05 = 0402 15 = 0603 21 = 0805 31 = 1206 32 = 1210 42 = 1808 43 = 1812 55 = 2220	Thickness See Cap Chart	Dielectric CG = COG R7 = X7R S7 = X7S T7 = X7T R8 = X8R L8 = X8L G8 = X8G	Voltage 0E = 2.5V 0G = 4V 0J = 6.3V 1A = 10V 1C = 16V 1E = 25V 1H = 50V 2A = 100V 2D = 200V 2E = 250V 2H = 500V 2J = 630V 3A = 1000V 3N = 1500V 3D = 2000V 3E = 2500V 3U = 3000V	Capacitance Code Code (in pF) 2 Significant Digits +Number of zeros eg 10uF = 106 10nF = 103 47pF = 470	Capacitance Tolerance B = $\pm 0.1\text{pF}$ (<10pF)* C = $\pm 0.25\text{pF}$ (<10pF)* D = $\pm 0.5\text{pF}$ (<10pF)* F = $\pm 1\%$ * G = $\pm 2\%$ * J = $\pm 5\%$ K = $\pm 10\%$ M = $\pm 20\%$	Packaging See Table Below

*C0G only

PACKAGING CODES

Packaging Code	Size Code	EIA (inch)	IEC (mm)	Width	Pitch	Material	Reel Size
H	03 & 05	0201 & 0402	0603 & 1005	8mm	2mm	Paper	7" Reel
T	15-32	0603-1210	1608-3225	8mm	4mm	Paper	
U	15-32	0603-1210	1608-3225	8mm	4mm	Embossed	
Y	42	1808	4520	12mm	4mm	Embossed	
V	43 & 55	1812 & 2220	4532 & 5750	12mm	8mm	Embossed	
N	03 & 05	0201 & 0402	0603 & 1005	8mm	2mm	Paper	13" Reel
M	15-32	0603-1210	1608-3225	8mm	4mm	Paper	
L	15-32	0603-1210	1608-3225	8mm	4mm	Embossed	
K	42	1808	4520	12mm	4mm	Embossed	
S	43 & 55	1812 & 2220	4532 & 5750	12mm	8mm	Embossed	
A	15-31	0603-1206	1608-3216	8mm	4mm	Paper	Maxi Reel*
D	21 & 31	0805 & 1206	2012 & 3216	8mm	4mm	Embossed	

Note: thickness determines paper or plastic embossed packaging

*please consult factory for maxi reel availability

DIELECTRIC

Dielectric	Operating Temperature (°C)	Capacitance Change Rate
X7R	-55~+125	$\pm 15\%$
X7T	-55~+125	$\pm 22/-33\%$
X8R	-55~+150	$\pm 15\%$
X8L	-55~+125	$\pm 15\%$
X8L	+125~+150	+15/-40%
X8G	-55~+150	0 $\pm 30\text{ppm}/^\circ\text{C}$
NP0	-55~+125	0 $\pm 30\text{ppm}/^\circ\text{C}$

TYPICAL APPLICATIONS

X7R KAM

- High capacitance values
- Broadest voltage and cap offering
- Cameras
- Body control modules
- Infotainment
- ECU
- Climate control

X7T KAM

- Motor drive
- Door lock

NP0 KAM

- Extreme capacitance stability
- Automotive LED Lighting System
- Key fob
- Audio
- Touchscreen
- GPS
- Safety

X8G KAM

- Extreme capacitance stability
- High temperature
- Battery Management Systems
- Powertrain Sensors & Actuators
- Engine management
- Transmission control
- Safety



The Important Information/Disclaimer is incorporated in the catalog where these specifications came from or available online at www.kyocera-avx.com/disclaimer/ by reference and should be reviewed in full before placing any order.

Automotive MLCC, KAM Series

General Specifications



COMMERCIAL VS AUTOMOTIVE MLCC PROCESS COMPARISON

	Commercial	Automotive
Administrative	Standard Part Numbers. No restriction on who purchases these parts.	Specific Automotive Part Number. Used to control supply of product to Automotive customers.
Lot Qualification (Destructive Physical Analysis - DPA)	As per EIA RS469	Increased sample plan stricter criteria.
Visual/Cosmetic Quality	Standard process and inspection	100% inspection
Application Robustness	Standard sampling for accelerated wave solder	Increased sampling for accelerated wave solder followed by lot by lot reliability testing.

All Tests have Accept/Reject Criteria 0/1

Automotive MLCC - COG

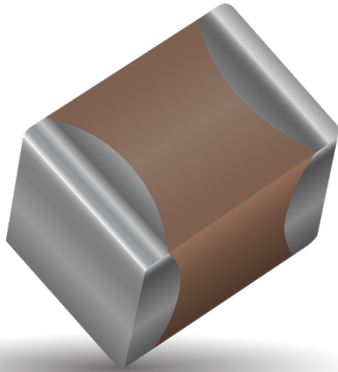
General Specifications

TYPICAL APPLICATIONS

- Extreme capacitance stability
- Automotive LED Lighting System
- Key fob
- Audio
- Touchscreen
- GPS
- Safety

ENGINEERING TOOLS

- Samples
- Technical Articles
- Application Engineering
- Application Support



Case Size	0402 (KAM05)	0603 (KAM15)		0805 (KAM21)		1206 (KAM31)				1210 (KAM32)						1812 (KAM43)	
Thickness Letter	A	A	B	B	K	A	B	N	D	G	Q	D	F	G	K	L	Y
Max Thickness (mm)	0.55	0.90	0.95	0.94	1.4	1.45	0.94	1.27	1.45	1.78	0.94	1.45	1.52	1.78	2.29	2.80	1.02
Carrier Tape	PAPER	PAPER	PAPER	PAPER	EMB	EMB	PAPER	EMB	EMB	EMB	PAPER	EMB	EMB	EMB	EMB	EMB	EMB
Packaging Code 7" reel	H	T	T	T	U	U	T	U	U	U	T	U	U	U	U	U	V
Packaging Code 13" reel	N	M	M	M	L	L	M	L	L	L	M	L	L	L	L	L	S
	PAPER						EMBOSSED (EMB)										

Automotive MLCC - X7R / X7T

General Specifications

TYPICAL APPLICATIONS

X7R KAM

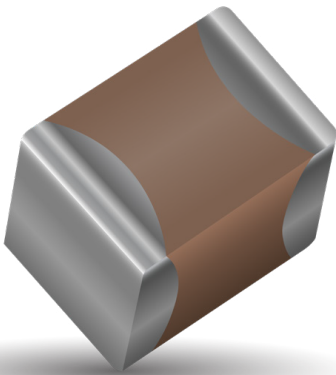
- High capacitance values
- Broadest voltage and cap offering
- Cameras
- Body control modules
- Infotainment
- ECU
- Climate control

X7T KAM

- Motor drive
- Door lock

ENGINEERING TOOLS

- Samples
- Technical Articles
- Application Engineering
- Application Support



Automotive MLCC - X7R, 4V to 500V

[illegible]

Length (mm) 3.2 ± 0.4

Width (mm) 1.0 ± 0.3

Thickness | Letter

[illegible]

Automotive MLCC - X7R, 630V to 3000V

Capacitance Range



PREFERRED SIZES ARE SHADED

Case Size		1206					1210				1808						1812						2220				
Soldering		Reflow/Wave					Reflow/Wave				Reflow Only						Reflow Only						Reflow Only				
(L) Length	mm (in.)	3.2 ± 0.2 (0.126 ± 0.008)					3.2 ± 0.2 (0.126 ± 0.008)				4.57 ± 0.25 (0.18 ± 0.01)						4.5 ± 0.3 (0.177 ± 0.012)						5.7 ± 0.5 (0.224 ± 0.02)				
(W) Width	mm (in.)	1.6 ± 0.2 (0.063 ± 0.008)					2.5 ± 0.2 (0.098 ± 0.008)				2.03 ± 0.25 (0.08 ± 0.01)						3.2 ± 0.2 (0.126 ± 0.008)						5 ± 0.4 (0.197 ± 0.016)				
(t) Terminal	mm max	0.5 ± 0.25 (0.02 ± 0.01)					0.5 ± 0.25 (0.02 ± 0.01)				0.61 ± 0.36 (0.024 ± 0.014)						0.61 ± 0.36 (0.024 ± 0.014)						0.64 ± 0.39 (0.025 ± 0.015)				
Voltage (V)		630	1000	1500	2000	2500	630	1000	1500	2000	630	1000	1500	2000	2500	3000	630	1000	1500	2000	2500	3000	630	1000	1500	2000	3000
101	Cap 100	B	B	B	B	B																					
121	(pF) 120	B	B	B	B	B																					
151	150	B	B	B	B	B																					
181	180	B	B	B	B	B																					
221	220	B	B	B	B	B					B	B	B	B	B	B											
271	270	B	B	B	B	B	H	H	H	H	B	B	B	B	B	B											
331	330	B	B	B	B	B	H	H	H	H	B	B	B	B	B	B	E										
391	390	B	B	B	B	B	H	H	H	H	B	B	B	B	B	B	E										
471	470	B	B	B	B	B	H	H	H	H	B	B	B	B	B	B	E	E	E	E	E	E					
561	560	B	B	B	B	B	H	H	H	H	B	B	B	B	B	B	E	E	E	E	E	E					
681	680	B	B	B	B	B	H	H	H	H	B	B	B	B	B	B	E	E	E	E	E	E					
821	820	B	B	B	B	B	H	H	H	H	B	B	C	C	C	C	E	E	E	E	E	E					
102	1000	B	B	B	B	B	H	H	H	H	B	B	C	C	C	C	E	E	E	E	E	E	Z	Z	Z	Z	C
122	1220	D	A	A	A		H	H	H	H							F	F	F	F	F		Z	Z	Z	Z	C
152	1500	D	A	A	A		H	H	H	H							F	F	F	F	F		Z	Z	Z	Z	C
182	1800	D	A	A			H	H	H	H							F	F	F	F	F		Z	Z	Z	Z	C
222	2200	D	A	A			H	H	H	H							F	F	F	F	F		Z	Z	Z	Z	C
272	2700	D	A	A			H	H	H	H							F	F	F	F			Z	Z	Z	Z	
332	3300	D	A				H	H	H	H							F	F	F	F			Z	Z	Z	Z	
392	3900	D	A				H	H	H								F	F	F	F			Z	Z	Z	Z	
472	4700	D	A				H	H	H								F	F	J	J			Z	Z	Z	Z	
562	5600	D	A				H	H	H								F	F	J	J			Z	Z	Z	Z	
682	6800	A	A				H	H									F	F	J	J			Z	Z	Z	Z	
822	8200	A					H	H									F	F	J	J			Z	Z	C	C	
103	Cap 0.01	A					H	H									F	F	J				C	C	C	C	
123	(μF) 0.012						H	H									F	F	J				C	C	C	C	
153	0.015						H	H									F	F	J				C	C	C	C	
183	0.018						H										F	F					C	C	C	C	
223	0.022						H										F	F					C	C	C	C	
273	0.027						H										F	F					C	C	C		
333	0.033																F						C	C			
393	0.039																F						C	C			
473	0.047																F						C	C			
563	0.056																						C	C			
683	0.068																						C	C			
823	0.082																						C	C			
104	0.1																						C	C			
124	0.12																						C				
154	0.15																						C				
224	0.22																										
334	0.33																										
474	0.47																										
684	0.68																										
105	1																										
WVDC		630	1000	1500	2000	2500	630	1000	1500	2000	630	1000	1500	2000	2500	3000	630	1000	1500	2000	2500	3000	630	1000	1500	2000	3000
Size		1206					1210				1808						1812						2220				

NOTE: Contact factory for non-specified capacitance values

Case Size	1206(KAM31)			1210(KAM32)		1808(KAM42)		1812(KAM43)			2220(KAM55)	
Thickness Letter	B	D	A	H		B	C	E	F	J	Z	C
Max Thickness	0.94	1.45	1.80	1.80		1.80	2.21	1.80	2.21	2.80	2.21	2.80
Carrier Tape	PAPER	EMB	EMB	EMB		EMB	EMB	EMB	EMB	EMB	EMB	EMB
Packaging Code 7"reel	T	U	U	U		Y	Y	V	V	V	V	V
Packaging Code 13"reel	M	L	L	L		K	K	S	S	S	S	S
PAPER						EMBOSSED (EMB)						

Automotive MLCC - X8R / X8L

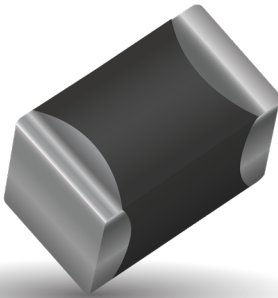
General Specifications

TYPICAL APPLICATIONS

- All market sectors with a 150°C requirement
- Automotive on engine applications
- Oil exploration applications
- Hybrid automotive applications
 - Battery control
 - Inverter / converter circuits
 - Motor control applications
 - Water pump
- Hybrid commercial applications
 - Emergency circuits
 - Sensors
 - Temperature regulation

ENGINEERING TOOLS

- Samples
- Technical Articles
- Application Engineering
- Application Support

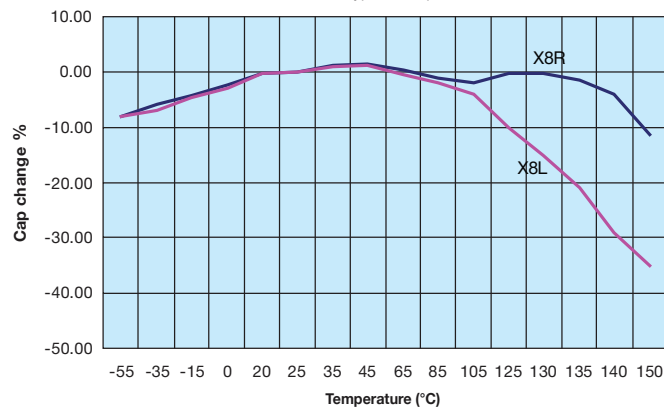


ADVANTAGES OF X8R AND X8L MLC CAPACITORS

- Both ranges are qualified to the highest automotive AEC-Q200 standards
- Excellent reliability compared to other capacitor technologies
- RoHS compliant
- Low ESR / ESL compared to other technologies
- Tin solder finish
- FLEXITERM® available
- 100V range available

X8R/X8L Dielectric

0805, 50V, X8R/X8L Typical Temperature Coefficient



Automotive MLCC - X8R / X8L

Capacitance Range

KYOCERA AVX has developed a range of multilayer ceramic capacitors designed for use in applications up to 150°C. These capacitors are manufactured with an X8R and an X8L dielectric material. X8R material has capacitance variation of $\pm 15\%$ between -55°C and +150°C. The X8L material has capacitance variation of $\pm 15\%$ between -55°C to 125°C to 125°C and +15/40% from +125°C to +150°C.

The need for X8R and X8L performance has been driven by customer requirements for parts that operate at elevated temperatures. They provide a highly reliable capacitor with low loss and stable capacitance over temperature.

They are ideal for automotive under the hood sensors, and various industrial applications. Typical industrial application would be drilling monitoring system. They can also be used as bulk capacitors for high temperature camera modules.

X8R

SIZE		0402		0603		0805		1206	
Soldering		Reflow/Wave		Reflow/Wave		Reflow/Wave		Reflow/Wave	
(L) Length	mm (in.)	1.0 ± 0.2 (0.04 ± 0.008)		1.6 ± 0.15 (0.063 ± 0.006)		2.01 ± 0.2 (0.079 ± 0.008)		3.2 ± 0.2 (0.126 ± 0.008)	
(W) Width	mm (in.)	0.5 ± 0.2 (0.02 ± 0.008)		0.81 ± 0.15 (0.032 ± 0.006)		1.25 ± 0.2 (0.049 ± 0.008)		1.6 ± 0.2 (0.063 ± 0.008)	
(t) Terminal	mm (in.)	0.25 ± 0.15 (0.01 ± 0.006)		0.35 ± 0.15 (0.014 ± 0.006)		0.5 ± 0.25 (0.02 ± 0.01)		0.5 ± 0.25 (0.02 ± 0.01)	
WVDC		50V		25V 50V 100V		25V 50V 100V		25V 50V 100V	
271	Cap 270	A	A	A	A				
331	(pF) 330	A	A	A	A	B	B	B	
471	470	A	A	A	A	B	B	B	
681	680	A	A	A	A	B	B	B	
102	1000	A	A	A	A	B	B	B	B
152	1500	A	A	A	A	B	B	B	B
182	1800	A	A	A	A	B	B	B	B
222	2200	A	A	A	A	B	B	B	B
272	2700	A	A	A	A	B	B	B	B
332	3300	A	A	A	A	B	B	B	B
392	3900	A	A	A	A	B	B	B	B
472	4700	A	A	A	A	B	B	B	B
562	5600			A	A	A	B	B	B
682	6800			A	A	A	B	B	B
822	8200			A	A	A	B	B	B
103	Cap 0.01			A	A	A	B	B	B
123	(uF) 0.012			A	A		B	B	B
153	0.015			A	A		B	B	B
183	0.018			A	A		B	B	B
223	0.022			A	A		B	B	B
273	0.027			A	A		B	B	B
333	0.033			A	A		B	B	B
393	0.039			A	A		B	B	B
473	0.047			A	A		B	B	B
563	0.056			A			A	N	N
683	0.068			A			A	N	N
823	0.082					A	A	N	N
104	0.1					A	A	N	N
124	0.12					A	A	N	N
154	0.15					A	A	N	N
184	0.18					A		N	N
224	0.22					A		N	N
274	0.27							N	N
334	0.33							N	N
394	0.39							E	G
474	0.47							E	G
684	0.68							G	G
824	0.82							G	G
105	1							G	G
WVDC		50V		25V 50V 100V		25V 50V 100V		25V 50V 100V	
SIZE		0402		0603		0805		1206	

Case Size	0402(KAM05)	0603(KAM15)		0805(KAM21)		1206(KAM31)				1210(KAM32)	2220(KAM55)
Thickness Letter	A	A	B	B	A	B	N	E	G	L	C
Max Thickness	0.56	0.90	0.95	0.94	1.45	0.94	1.27	1.52	1.78	2.79	2.80
Carrier Tape	PAPER	PAPER	PAPER	PAPER	EMB	PAPER	EMB	EMB	EMB	EMB	EMB
Packaging Code 7' reel	H	T	T	T	U	T	U	U	U	U	V
Packaging Code 13' reel	N	M	M	M	L	M	L	L	L	L	S
	PAPER					EMBOSSED (EMB)					

X8L

SIZE		0603		0805		1206		1210		2220	
Soldering		Reflow/Wave		Reflow/Wave		Reflow/Wave		Reflow/Wave		Reflow Only	
(L) Length	mm (in.)	1.6 ± 0.15 (0.063 ± 0.006)		2.01 ± 0.2 (0.079 ± 0.008)		3.2 ± 0.2 (0.126 ± 0.008)		3.2 ± 0.2 (0.126 ± 0.008)		5.7 ± 0.5 (0.224 ± 0.02)	
(W) Width	mm (in.)	0.81 ± 0.15 (0.032 ± 0.006)		1.25 ± 0.2 (0.049 ± 0.008)		1.6 ± 0.2 (0.063 ± 0.008)		2.5 ± 0.2 (0.098 ± 0.008)		5 ± 0.4 (0.197 ± 0.016)	
(t) Terminal	mm (in.)	0.35 ± 0.15 (0.014 ± 0.006)		0.5 ± 0.25 (0.02 ± 0.01)		0.5 ± 0.25 (0.02 ± 0.01)		0.5 ± 0.25 (0.02 ± 0.01)		0.64 ± 0.39 (0.025 ± 0.015)	
WVDC		25V 50V 100V		25V 50V 100V		16V 25V 50V 100V		10V 25V 50V 100V		200V 250V	
271	Cap 270	A	A								
331	(pF) 330	A	A	A	B	B	B				
471	470	A	A	A	B	B	B				
681	680	A	A	A	B	B	B				
102	1000	A	A	A	B	B	B				
152	1500	A	A	A	B	B	B				
182	1800	A	A	A	B	B	B				
222	2200	A	A	A	B	B	B				
272	2700	A	A	A	B	B	B				
332	3300	A	A	A	B	B	B				
392	3900	A	A	A	B	B	B				
472	4700	A	A	A	B	B	B				
562	5600	A	A	A	B	B	B				
682	6800	A	A	A	B	B	B				
822	8200	A	A	A	B	B	B				
103	Cap 0.01	A	A	A	B	B	B				
123	(uF) 0.012	A	A		B	B	B				
153	0.015	A	A		B	B	B				
183	0.018	A	A		B	B	B				
223	0.022	A	A		B	B	B				
273	0.027	A	A		B	B	B				
333	0.033	A	A		B	B	A				
393	0.039	A	A		B	B	A				
473	0.047	A	A		B	B	A				
563	0.056	A	A		B	B	A				
683	0.068	A	A		B	B	A				
823	0.082	A	A		B	B	A				
104	0.1	A	A		B	B	A				
124	0.12				B	A					
154	0.15				B	A					
184	0.18				A	A					
224	0.22				A	A					
274	0.27				A	A					
334	0.33				A	A					
394	0.39				A	A					
474	0.47				A	A					
684	0.68				A	A					
824	0.82				A	A					
105	1				A	A					
155	1.5										
225	2.2										
475	4.7										
106	10										
WVDC		25V 50V 100V		25V 50V 100V		16V 25V 50V 100V		10V 25V 50V 100V		200V 250V	
SIZE		0603		0805		1206		1210		2220	

Automotive MLCC - X8G

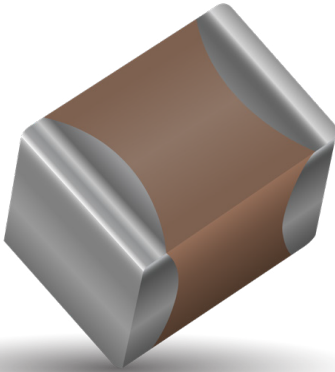
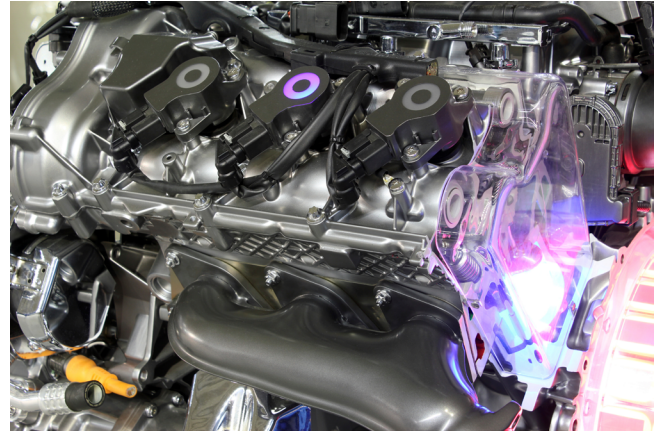
General Specifications

TYPICAL APPLICATIONS

- Extreme capacitance stability
- High temperature
- Battery Management Systems
- Powertrain Sensors & Actuators
- Engine management
- Transmission control
- Safety

ENGINEERING TOOLS

- Samples
- Technical Articles
- Application Engineering
- Application Support



Automotive X8G (-55°C to 150°C , ±30ppm/°C)

Capacitance Range



SIZE		0402		0603		0805			
Soldering		Reflow/Wave		Reflow/Wave		Reflow/Wave			
(L) Length	mm (in.)	1 ± 0.1 (0.04 ± 0.004)		1.6 ± 0.15 (0.063 ± 0.006)		2.01 ± 0.2 (0.079 ± 0.008)			
(W) Width	mm (in.)	0.5 ± 0.1 (0.02 ± 0.004)		0.81 ± 0.15 (0.032 ± 0.006)		1.25 ± 0.2 (0.049 ± 0.008)			
(t) Terminal	mm (in.)	0.25 ± 0.15 (0.01 ± 0.006)		0.35 ± 0.15 (0.014 ± 0.006)		0.5 ± 0.25 (0.02 ± 0.01)			
WVDC		25V	50V	25V	50V	50V	100V	200V	250V
0R5	0.5			A	A	B	B	B	B
1R0	1.0			A	A	B	B	B	B
1R2	1.2			A	A	B	B	B	B
1R5	1.5			A	A	B	B	B	B
1R8	1.8			A	A	B	B	B	B
2R2	2.2			A	A	B	B	B	B
2R7	2.7			A	A	B	B	B	B
3R3	3.3			A	A	B	B	B	B
3R9	3.9			A	A	B	B	B	B
4R7	4.7			A	A	B	B	B	B
5R0	5			A	A	B	B	B	B
5R6	5.6			A	A	B	B	B	B
6R8	6.8			A	A	B	B	B	B
8R2	8.2			A	A	B	B	B	B
100	10			A	A	B	B	B	B
120	12			A	A	B	B	B	B
150	15			A	A	B	B	B	B
180	18			A	A	B	B	B	B
220	22			A	A	B	B	B	B
270	27			A	A	B	B	B	B
330	33			A	A	B	B	B	B
390	39			A	A	B	B	B	B
470	47	A	A	A	A	B	B	B	B
510	51	A	A	A	A	B	B	B	B
560	56	A	A	A	A	B	B	B	B
680	68	A	A	A	A	B	B	B	J
820	82	A	A	A	A	B	B	B	J
101	100	A	A	A	A	B	B	B	J
121	120			A	A	B	B	B	J
151	150			A	A	B	B	B	J
181	180			A	A	B	B	B	J
221	220			A	A	B	B	B	J
271	270			A	A	B	B	B	J
331	330			A	A	B	B	B	J
391	390			A	A	B	B	B	J
471	470			A	A	B	B	B	J
561	560			A	A	B	B	J	J
681	680			A	A	B	B	J	J
821	820					B	B	J	J
102	1000					B	B	J	J
122	1200					B	B	J	J
152	1500					B	B	J	J
182	1800								
222	2200								
272	2700								
332	3300								
392	3900								
472	4700								
562	5600								
682	6800								
103	10nF								
WVDC		25V	50V	25V	50V	50V	100V	200V	250V
Size		0402		0603		0805			

Case Size	0402(KAM05)	0603(KAM15)	0805(KAM21)	
Letter	A	A	B	J
Max Thickness mm	0.56	0.90	0.94	1.27
Carrier Tape	Paper	Paper	Paper	Emb
Packaging Code 7"reel	H	T	T	U
Packaging Code 13"reel	N	M	M	L
	PAPER			EMBOSSSED