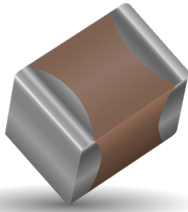


X7R Dielectric, KGM Series

General Specifications



The X7R dielectric is the most popular of the intermediate EIA class II materials due to its relative temperature stability. While the capacitance change is non-linear, temperature variation is within $\pm 15\%$ from -55°C to $+125^{\circ}\text{C}$.

Capacitance for X7R varies under the influence of electrical operating conditions such as voltage and frequency. X7R dielectric chip usage covers a broad spectrum of industrial applications where known changes in capacitance due to applied voltages are acceptable.

SpiCAT is an additional online resource that KYOCERA AVX offers to help create engineering simulations. Please visit spicat.kyocera-avx.com for more information.

HOW TO ORDER

KGM

Series
General Purpose
Tin/Nickel Finish

03

Size

02= 01005 32= 1210
03= 0201 43= 1812
05= 0402 44= 1825
15= 0603 55= 2220
21= 0805 56= 2225
31= 1206

A

Thickness
See Cap Chart

R7

Dielectric
R7 = X7R

1E

Voltage

0G = 4.0V 1H = 50V
0J = 6.3V 2A = 100V
1A = 10V 2D = 200V
1C = 16V 2E = 250V
1E = 25V 2H = 500V

101

Capacitance Code
2 Significant Digits +
Number of zeros
eg. 106 = $10\mu\text{F}$
103 = 10nF

M

Tolerance
J* = $\pm 5\%$
K = $\pm 10\%$
M = $\pm 20\%$

* $\leq 1\mu\text{F}$ only, contact
factory for additional
values

N

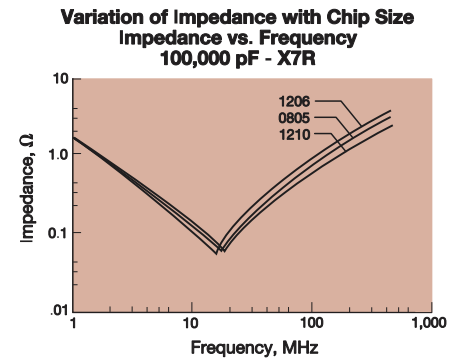
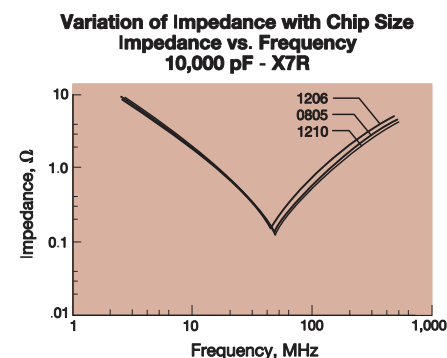
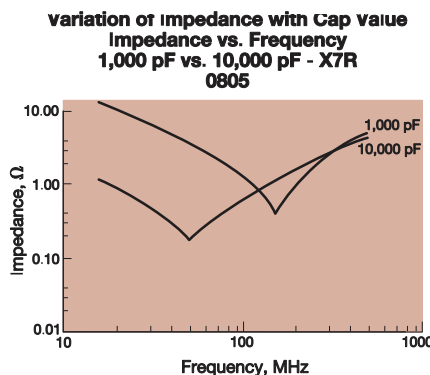
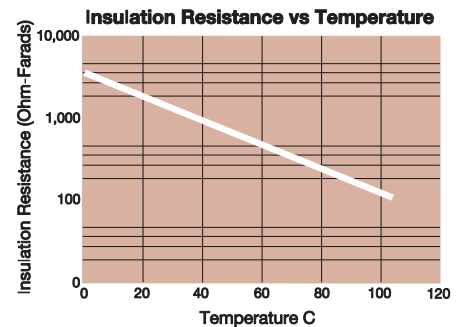
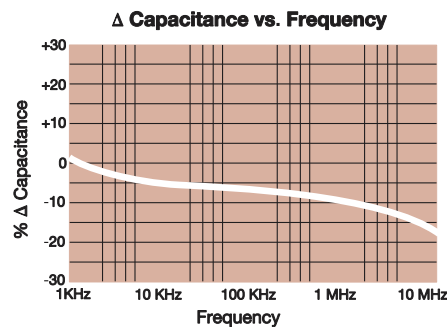
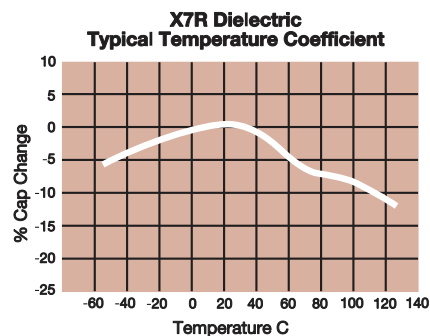
Packaging
See Table Below



PACKAGING CODES

Code	EIA (inch)	IEC(mm)	7" Paper	7" Embossed	13" Paper	13" Embossed
02	01005	0402	H			
03	0201	0603	H		N	
05	0402	1005	H		N	
15	0603	1608	T		M	
21	0805	2012	T	U	M	L
31	1206	3216	T	U	M	L
32	1210	3225		U		L
43	1812	4532		V		S
44	1825	4564		V		S
55	2220	5750		V		S
56	2225	5763		V		S

*Note: The thickness determines if packaging is paper or embossed.



X7R Dielectric, KGM Series

Specifications and Test Methods

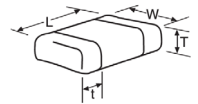


Parameter/Test		X7R Specification Limits	Measuring Conditions (Complies with JIS C5101 / IEC60384)									
Operating Temperature Range		-55°C to +125°C	Temperature Cycle Chamber									
Capacitance		Within specified tolerance	Measure after heat treatment Capacitance Frequency Volt C≤10μF Frequency : 1kHz±10% Volt : 1.0±0.2Vrms *0.5±0.2Vrms									
Dissipation Factor / Tanδ		Refer to https://spicat.kyocera-avx.com for individual part number specification	C>10μF Frequency : 120Hz±10% Volt : 0.5±0.2Vrms The charge and discharge current of the capacitor must not exceed 50mA.									
Insulation Resistance		Refer to https://spicat.kyocera-avx.com for individual part number specifiction	Apply the rated voltage for 1 minute, and measure it in normal temperature and humidity. The charge and discharge current of the capacitor must not exceed 50mA.									
Dielectric Strength		No breakdown or visual defects	Charge device with 250% of rated voltage for 1-5 seconds, w/charge and discharge current limited to 50 mA (max) Note: Charge device with 150% of rated voltage for 500V devices.									
Bending Strength		No significant damage with 1mm bending	Glass epoxy PCB: Fulcrum spacing: 90mm, duration time 10 seconds.									
Solderability		Solder coverage : 95% min.	Soaking condition Sn-3Ag-0.5Cu 245±5°C 3±0.5 sec.									
Resistance to Solder Heat	Appearance	No problem observed	Take the initial value after heat treatment. Soak the sample in 260°C±5°C solder for 10±0.5 seconds and place in normal temperature and humidity, and measure after heat treatment. (Pre-heating conditions) <table><tr><td>Order</td><td>Temperature</td><td>Time</td></tr><tr><td>1</td><td>80 to 100°C</td><td>2 minutes</td></tr><tr><td>2</td><td>150 to 200°C</td><td>2 minutes</td></tr></table> The charge and discharge current of the capacitor must not exceed 50mA for IR and withstanding voltage measurement.	Order	Temperature	Time	1	80 to 100°C	2 minutes	2	150 to 200°C	2 minutes
	Order	Temperature		Time								
	1	80 to 100°C		2 minutes								
	2	150 to 200°C		2 minutes								
	Capacitance Variation	≤ ±7.5%										
Dissipation Factor / Tanδ	Within specification											
Insulation Resistance	Within specification											
Withstanding Voltage / Dielectric Strength	Resist without problem											
Thermal Shock	Appearance	No visual defects	Take the initial value after heat treatment. (Cycle) Room temperature (3 min.)→> Lowest operation temperature (30 min.)→> Room temperature (3 min.)→> Highest operation temperature(30 min.) After 5 cycles, measure after heat treatment. The charge and discharge current of the capacitor must not exceed 50mA for IR and withstanding voltage measurement.									
	Capacitance Variation	≤ ±7.5%										
	Dissipation Factor	Within specification										
	Insulation Resistance	Within specification										
	Withstanding Voltage / Dielectric Strength	Resist without problem										
Load Life	Appearance	No visual defects	Take the initial value after heat treatment. After applying *1.5 the rated voltage at the highest operation temperature for 1000+12/- 0 hours, and measure the sample after heat treatment in normal temperature and humidity. The charge and discharge current of the capacitor must not exceed 50mA for IR measurement. *Apply 1.0 times when the rated voltage is 4V or less. Applied voltages for respective products are indicated in the chart below.									
	Capacitance Variation	≤ ±12.5%										
	Dissipation Factor / Tanδ	≤ Initial Value x 2.0 (See Above)										
	Insulation Resistance	Over 1000MΩ or 50MΩ · μF, whichever is less. *Exceptions Listed Below										
Load Humidity	Appearance	No visual defects	Take the initial value after heat treatment. After applying rated voltage for 500+12/- 0 hours in the condition of 40°C ± 2°C and 90 to 95%RH, and place in normal temperature and humidity, then measure the sample after heat treatment. The charge and discharge current of the capacitor must not exceed 50mA for IR measurement.									
	Capacitance Variation	≤ ±12.5%										
	Dissipation Factor / Tanδ	Within specification										
	Insulation Resistance	Over 1000MΩ or 50MΩ · μF, whichever is less. *Exceptions Listed Below										
Appearance		No problem observed	Microscope									
Termination Strength		No problem observed	Apply a sideward force of 500g (5N) to a PCB-mounted sample. note : 2N for 0201 size, and 1N for 01005 size.									
Vibration	Appearance	No problem observed	Take the initial value after heat treatment. Vibration frequency: 10 to 55 (Hz) Amplitude: 1.5mm Sweeping condition: 10 →> 55 →> 10Hz/ 1 minute in X, Y and Z directions: 2 hours each, 6 hours in total, and place in normal temperature and humidity, then measure the sample after heat treatment.									
	Capacitance	Within tolerance										
	Tanδ	Within tolerance										
Heat Treatment		Expose sample in the temperature of 150+0/- 10°C for 1 hour and leave the sample in normal temperature and humidity for 24±2 hours.										

Voltage to be applied in the High Temperature Load (Applied voltage is the multiple of the rated voltage)

X7R Dielectric, KGM Series

Capacitance Range



SIZE	01005		0201					0402					0603					0805					1206															
Soldering	Reflow Only		Reflow Only					Reflow/Wave					Reflow/Wave					Reflow/Wave					Reflow/Wave															
Packaging	All Paper		All Paper					All Paper					Paper/Embossed					Paper/Embossed					Paper/Embossed															
(L) Length	mm (in.)	0.40 ± 0.02 (0.016 ± 0.0008)	0.60 ± 0.03 (0.024 ± 0.001)					1.00 ± 0.10 (0.040 ± 0.004)					1.60 ± 0.15 (0.063 ± 0.006)					2.01 ± 0.20 (0.079 ± 0.008)					3.20 ± 0.30 (0.126 ± 0.012)															
(W) Width	mm (in.)	0.20 ± 0.02 (0.008 ± 0.0008)	0.30 ± 0.03 (0.011 ± 0.001)					0.50 ± 0.10 (0.020 ± 0.004)					0.81 ± 0.15 (0.032 ± 0.006)					1.25 ± 0.20 (0.049 ± 0.008)					1.60 ± 0.30 (0.063 ± 0.012)															
(t) Terminal	mm (in.)	0.10± 0.04 (0.004 ± 0.0016)	0.15 ± 0.05 (0.006 ± 0.002)					0.25 ± 0.15 (0.010 ± 0.006)					0.35 ± 0.15 (0.014 ± 0.006)					0.50 ± 0.25 (0.020 ± 0.010)					0.50 ± 0.25 (0.020 ± 0.010)															
WVDC	16	6.3	10	16	25	50	6.3	10	16	25	50	100	6.3	10	16	25	50	100	200	250	6.3	10	16	25	50	100	200	250	500	6.3	10	16	25	50	100	200	250	500
Cap	100 101	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B	B																	
(pF)	150 151	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B	B																	
	220 221	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B	B	N	N	N	N	N	N	N	N	B	B	B	B	B	T	T	D	
	330 331	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B	B	N	N	N	N	N	N	N	N	B	B	B	B	B	T	T	D	
	470 471	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B	B	N	N	N	N	N	N	N	N	B	B	B	B	B	T	T	D	
	680 681	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B	B	N	N	N	N	N	N	N	N	B	B	B	B	B	T	T	D	
	1000 102	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B	B	N	N	N	N	N	N	N	N	B	B	B	B	B	T	T	D	
	1500 152	A	A	A	A		A	A	A	A	A	A	A	A	A	A	A	A	A	B	B	N	N	N	N	N	N	N	N	B	B	B	B	B	T	T	D	
	2200 222	A	A	A	A		A	A	A	A	A	A	A	A	A	A	A	A	A	B	B	N	N	N	N	N	N	N	N	B	B	B	B	B	T	T	D	
	3300 332		A	A	A		A	A	A	A	A	A	A	A	A	A	A	A	A	B	B	N	N	N	N	N	N	N	N	A	A	B	B	B	B	T	T	D
	3900 392		A	A	A		A	A	A	A	A	A	A	A	A	A	A	A	A	B	B	N	N	N	N	N	N	N	N	A	A	B	B	B	B	T	T	D
	4700 472		A	A	A		A	A	A	A	A	A	A	A	A	A	A	A	A	B	B	N	N	N	N	N	N	N	N	A	A	B	B	B	B	T	T	D
	5600 562		A	A	A		A	A	A	A	A	A	A	A	A	A	A	A	A	B	B	N	N	N	N	N	N	N	N	A	A	B	B	B	B	T	T	D
	6800 682		A	A	A		A	A	A	A	A	A	A	A	A	A	A	A	A	B	B	N	N	N	N	N	N	N	N	A	A	B	B	B	B	T	T	D
Cap	0.010 103		A	A	A		A	A	A	A	A	A	A	A	A	A	A	A	A	B	B	N	N	N	N	N	N	N	N	A	A	B	B	B	B	D	D	D
(μF)	0.012 123						A	A	A	A			A	A	A	A	A	A	A	B	B	N	N	N	N	N	N	N	N	A	A	B	B	B	B	D	D	D
	0.015 153						A	A	A	A			A	A	A	A	A	A	B	B	B	N	N	N	N	N	N	N	A	A	A	B	B	B	B	D	D	D
	0.018 183						A	A	A	A			A	A	A	A	A	A	B	B	B	N	N	N	N	N	N	N	A	A	A	B	B	B	B	D	D	D
	0.022 223		A	A	A		A	A	A	A			A	A	A	A	A	A	B	B	B	N	N	N	N	N	N	N	A	A	A	B	B	B	B	D	D	A
	0.027 273						A	A	A	A			A	A	A	A	B	B				N	N	N	N	N	N	N	A	A		B	B	B	B	D	D	A
	0.033 333						A	A	A	A			A	A	A	B	B	B				N	N	N	N	N	N	N	A	A		B	B	B	B	A	A	A
	0.039 393						A	A	A	A			A	A	A	B	B	B				N	N	N	N	N	N	N	A	A		B	B	B	B	A	A	A
	0.047 473						A	A	A	A			A	A	A	B	B	B				N	N	N	N	N	N	N	A	A	A	B	B	B	B	A	A	A
	0.068 683						A	A	A	A	C		A	A	A	B	B	B				N	N	N	N	N	N	N	A			B	B	B	B	D	A	A
	0.082 823						A	A	A	A	C		A	A	A	B	B	B				N	N	N	N	N	N	N	A			B	B	B	B	D	A	A
	0.1 104		A				A	A	A	A	C		A	A	A	B	B	B				N	N	N	N	N	N	N	A	A		B	B	B	B	D	A	A
	0.12 124												A	A	A	B	B					N	N	N	N	E	A				B	B	B	B	D	A	A	
	0.15 154						A	A	A	A			A	A	A	B	B					E	E	E	E	A					V	V	V	M	A	A	A	
	0.22 224						A	A	A	A			A	B	B	B	B					A	A	A	A	A					V	V	V	M	A	A	A	
	0.33 334												B	B	B	B	B					A	A	A	A	A					V	V	V	M	P	A		
	0.47 474						A	A					B	B	B	B	B					A	A	A	A	A					H	H	H	H	H	A		
	0.68 684												B	B	B							A	A	A	A	A					H	H	H	H	H			
	1.0 105						A	A					B	B	B	B	C					A	A	A	A	A					H	H	H	H	H			
	2.2 225												B	B	C							A	A	A	A						H	H	H	H	H			
	4.7 475												C									A	A	A							H	H	A	A				
	10 106																					A	A	A							H	H	A	A	H			
	22 226																														A	A						
	47 476																																					
	100 107																																					
WVDC	16	6.3	10	16	25	50	6.3	10	16	25	50	100	6.3	10	16	25	50	100	200	250	6.3	10	16	25	50	100	200	250	500	6.3	10	16	25	50	100	200	250	500
SIZE	01005	0201					0402					0603					0805					1206																

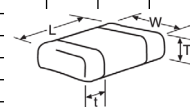
Case Size	01005 (KGM 02)	0201 (KGM03)	0402 (KGM05)	0603 (KGM15)			0805 (KGM21)					1206 (KGM31)							
Thickness Letter	A	A	A	C	A	B	C	B	N	E	A	B	V	M	T	P	D	A	H
Max Thickness (mm)	0.22	0.33	0.55	0.70	0.90	0.95	1.00	0.94	1.00	1.35	1.45	0.94	1.22	1.25	1.35	1.40	1.45	1.80	1.90
Carrier Tape	PAPER	PAPER	PAPER	PAPER	PAPER	PAPER	PAPER	PAPER	PAPER	EMB	EMB	PAPER	EMB	EMB	EMB	EMB	EMB	EMB	EMB
Packaging Code 7"reel	H	H	H	H	T	T	T	T	T	U	U	T	U	U	U	U	U	U	U
Packaging Code 13"reel	n/a	N	N	N	M	M	M	M	M	L	L	M	L	L	L	L	L	L	L
PAPER												EMBOSS (EMB)							

X7R Dielectric, KGM Series

Capacitance Range



SIZE		1210						1812						1825				2220					2225				
Soldering		Reflow Only						Reflow Only						Reflow Only				Reflow Only					Reflow Only				
Packaging		Paper/Embossed						All Embossed						All Embossed				All Embossed					All Embossed				
(L) Length	mm (in.)	3.30 ± 0.4 (0.130 ± 0.016)						4.50 ± 0.40 (0.177 ± 0.016)						4.50 ± 0.40 (0.177 ± 0.016)				5.70 ± 0.50 (0.224 ± 0.020)					5.70 ± 0.40 (0.224 ± 0.016)				
(W) Width	mm (in.)	2.50 ± 0.30 (0.098 ± 0.012)						3.20 ± 0.40 (0.126 ± 0.016)						6.40 ± 0.40 (0.252 ± 0.016)				5.00 ± 0.40 (0.197 ± 0.016)					6.30 ± 0.40 (0.248 ± 0.016)				
(t) Terminal	mm (in.)	0.50 ± 0.25 (0.020 ± 0.010)						0.61 ± 0.36 (0.024 ± 0.014)						0.61 ± 0.36 (0.024 ± 0.014)				0.64 ± 0.39 (0.025 ± 0.015)					0.64 ± 0.39 (0.025 ± 0.015)				
WVDC		10	16	25	50	100	200	500	16	25	50	100	200	500	50	100	200	500	25	50	100	200	500	50	100	200	500
Cap 100	101																										
(pF) 150	151																										
220	221	R	R	R	R	R	R	D																			
330	331	R	R	R	R	R	R	D	A	A	A	A	A	A													
470	471	R	R	R	R	R	R	D	A	A	A	A	A	A													
680	681	R	R	R	R	R	R	D	A	A	A	A	A	A													
1000	102	R	R	R	R	R	R	D	A	A	A	A	A	B	C	C	C	C	Z	Z	Z	Z	Z	D	D	D	D
1500	152	R	R	R	R	R	R	D	A	A	A	A	A	B	C	C	C	C	Z	Z	Z	Z	Z	D	D	D	D
2200	222	R	R	R	R	R	R	D	A	A	A	A	A	B	C	C	C	C	Z	Z	Z	Z	Z	D	D	D	D
3300	332	R	R	R	R	R	R	E	A	A	A	A	A	B	C	C	C	C	Z	Z	Z	Z	Z	D	D	D	D
3900	392	R	R	R	R	R	R	E	A	A	A	A	A	B	C	C	C	C	Z	Z	Z	Z	Z	D	D	D	D
4700	472	R	R	R	R	R	R	E	A	A	A	A	A	B	C	C	C	C	Z	Z	Z	Z	Z	D	D	D	D
5600	562	R	R	R	R	R	R	E	A	A	A	A	A	B	C	C	C	C	Z	Z	Z	Z	Z	D	D	D	D
6800	682	R	R	R	R	R	R	E	A	A	A	A	A	B	C	C	C	C	Z	Z	Z	Z	Z	D	D	D	D
Cap 0.010	103	R	R	R	R	R	R	E	A	A	A	A	A	B	C	C	C	C	Z	Z	Z	Z	Z	D	D	D	D
(pF) 0.012	123	R	R	R	R	R	R	E	A	A	A	A	A	B	C	C	C	C	Z	Z	Z	Z	Z	D	D	D	D
0.015	153	R	R	R	R	R	R	E	A	A	A	A	A	B	C	C	C	C	Z	Z	Z	Z	Z	D	D	D	D
0.018	183	R	R	R	R	R	R	E	A	A	A	A	A	B	C	C	C	C	Z	Z	Z	Z	Z	D	D	D	D
0.022	223	R	R	R	R	R	R	E	A	A	A	A	A	B	C	C	C	C	Z	Z	Z	Z	Z	D	D	D	D
0.027	273	R	R	R	R	R	R	E	H	A	A	A	A	B	C	C	C	C	Z	Z	Z	Z	Z	D	D	D	D
0.033	333	R	R	R	R	R	R	E	H	A	A	A	A	B	C	C	C	C	Z	Z	Z	Z	Z	D	D	D	D
0.039	393	R	R	R	R	R	R	E	H	A	A	A	A	B	C	C	C	C	Z	Z	Z	Z	Z	D	D	D	D
0.047	473	R	R	R	R	R	R	E	H	A	A	A	A	B	C	C	C	C	Z	Z	Z	Z	Z	D	D	D	D
0.068	683	R	R	R	R	R	R	H	P	A	A	A	A	B	F	C	C	C	C	Z	Z	Z	Z	D	D	D	D
0.082	823	R	R	R	R	R	R	H	P	A	A	A	A	B	F	C	C	C	C	Z	Z	Z	Z	D	D	D	D
0.100	104	R	R	R	R	R	R	H	P	A	A	A	A	B	F	C	C	C	C	Z	Z	Z	Z	D	D	D	D
0.120	124	R	R	R	R	R	R	H		A	A	A	A	B	J	C	C	C	C	Z	Z	Z	Z	D	D	D	D
0.150	154	E	E	E	E	E	E	L		A	A	A	A	B	F	J	C	C	C	C	Z	Z	Z	Z	D	D	D
0.220	224	E	E	E	E	E	E	L		A	A	A	A	B	F	J	C	C	C	C	Z	Z	Z	Z	D	D	D
0.330	334	E	E	E	E	E	H	L		A	A	A	A	B	F	J	C	C	C	C	Z	Z	Z	Z	D	D	D
0.470	474	E	E	E	E	E	L	L		A	A	A	A	F	F	J	C	C	C	C	Z	Z	Z	Z	D	D	D
0.680	684	E	E	E	E	E	L	L		F	F	F	F	J		C	C	C		Z	Z	Z	Z	D	D	D	G
1.000	105	E	E	E	E	G	L			F	F	F	F	J		C	C	C		Z	Z	Z	Z	D	D	D	
2.200	225	L	L	L	L	L				F	F	F	J			C	C	F		Z	Z	Z	C		D	D	G
4.700	475	L	L	L	L	L				J	J	J	J			C	F			Z	C	C			D	G	
10	106	L	L	L	L	A				J	J	J				F	F			C	C	D			G	G	
22	226	L	A	L																D	D	H					
47	476	L																									
100	107																										
WVDC		10	16	25	50	100	200	500	16	25	50	100	200	500	50	100	200	500	25	50	100	200	500	50	100	200	500
SIZE		1210						1812						1825				2220					2225				



Case Size	1210 (KGM 32)								1812 (KGM 43)				1825 (KGM 44)		2220 (KGM 55)				2225 (KGM 56)	
Thickness Letter	R	D	E	G	H	P	A	L	A	B	F	J	C	F	Z	C	D	H	D	G
Max Thickness (mm)	1.05	1.4	1.45	1.78	1.8	2.2	2.70	2.80	1.4	1.45	2.21	2.80	2.21	2.80	2.21	2.80	3.3	3.4	2.21	2.80
Carrier Tape	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB
Packaging Code 7" reel	U	U	U	U	U	U	U	U	V	V	V	V	V	V	V	V	V	V	V	V
Packaging Code 13" reel	L	L	L	L	L	L	L	L	S	S	S	S	S	S	S	S	S	S	S	S
EMBOSSED (EMB)																				