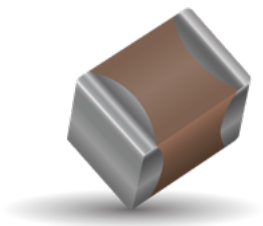
X7R Dielectric, KGM Series

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 ±15% from - 55°C to + 125°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 KAVX offers to help create engineering simulations. Please visit spicat.kyocera-avx.com for more information.

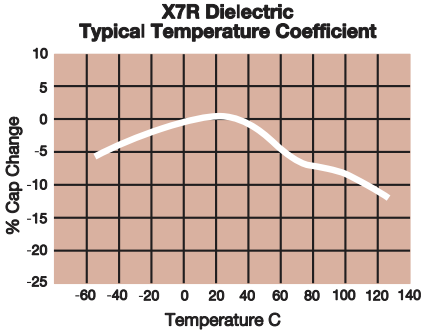
HOW TO ORDER

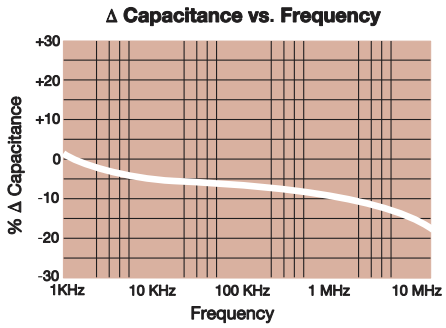
KGM	03	A	R7	1E	101	M	N
General Purpose Tin/Nickel Finish	**Size** 02= 01005 03= 0201 05= 0402 15= 0603 21= 0805 31= 1206 32= 1210 43= 1812 44= 1825 55= 2220 56= 2225	**Thickness** See Cap Chart	R7 = X7R	0G = 4.0V 0J = 6.3V 1A = 10V 1C = 16V 1E = 25V 1H = 50V 2A = 100V 2D = 200V 2E = 250V 2H = 500V	2 Significant Digits + Number of zeros eg. 106 = 10µF 103 = 10nF	**Capacitance Tolerance** J* = +/- 5% K = +/- 10% M = +/- 20% *≤1µF only, contact factory for additional values	See Table Below RoHS COMPLIANT

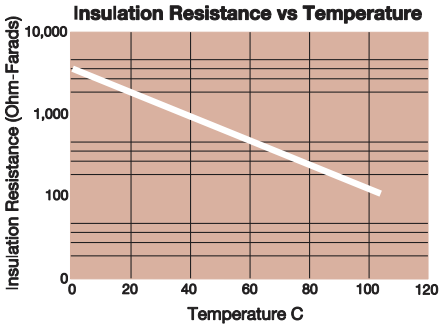
PACKAGING CODES

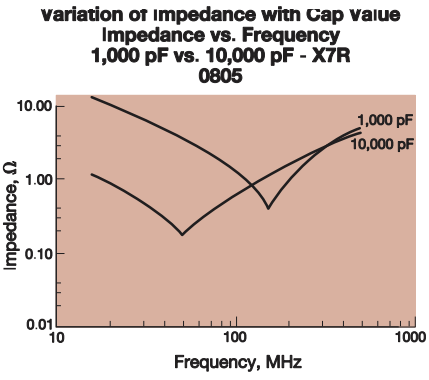
Code	EIA (inch)	IEC(mm)	7" Paper	7" Embossed	13" Paper	13"Embossed
02	01005	0402	H			
03	0201	0603	H		N	
05	0402	1005	H		N	
15	0603	1608	T		M	
21	0805	2012	T	U	M	L
31	1206	3216	T	U	M	L
32	1210	3225		U		L
43	1812	4532		V		S
44	1825	4564		V		S
55	2220	5750		V		S
56	2225	5763		V		S

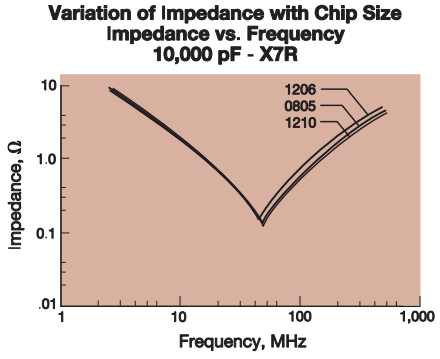
*Note: The thickness determines if packaging is paper or embossed.

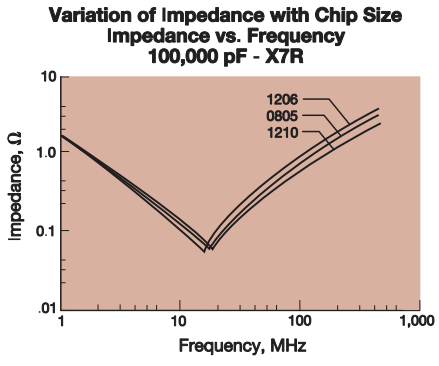












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X7R Dielectric, KGM Series

Specifications and Test Methods

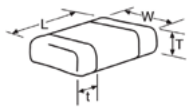
Parameter/Test		X7R Specification Limits	Measuring Conditions (Complies with JIS C5101 / IEC60384)
Operating Temperature Range		-55ºC to +125ºC	Temperature Cycle Chamber
Capacitance		Within specified tolerance	Measure after heat treatment Capacitance Frequency Volt C≤10µF Frequency : 1kHz±10% Volt : 1.0±0.2Vrms *0.5±0.2Vrms C>10µF Frequency : 120Hz±10% Volt : 0.5±0.2Vrms The charge and discharge current of the capacitor must not exceed 50mA.
Dissipation Factor / Tanδ		Refer to https://spicat.kyocera-avx.com for individual part number specification	
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±5ºC 3±0.5 sec.
Resistance to Solder Heat	Appearance	No problem observed	Take the initial value after heat treatment. Soak the sample in 260ºC±5ºC solder for 10±0.5 seconds and place in normal temperature and humidity, and measure after heat treatment. (Pre-heating conditions) Order Temperature Time 1 80 to 100ºC 2 minutes 2 150 to 200ºC 2 minutes The charge and discharge current of the capacitor must not exceed 50mA for IR and withstanding voltage measurement.
	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 40ºC ± 2ºC and 90 to 95%RH, and place in normal temperature and humid- ity, 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/ −10ºC 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)

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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									B								
(pF)	150 151	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B	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	B	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	B	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	B	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	B	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	B	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	B	B		N	N	N	N	N	N	N	B	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	B	B		N	N	N	N	N	N	N	B	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	A	A	A	B	B	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	A	A	A	B	B	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	A	A	A	B	B	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	A	A	A	B	B	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	A	A	A	B	B	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	A	A	A	B	B	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	A	A	A	B	B	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	A	A	A	A	B	B	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	A	A	A	A	B	B	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	A	A	A	A	B	B	B	B	B	B	D	D	A
	0.027 273							A	A	A	A	A		A	A	A	A	B	B				N	N	N	N	A	A	A		B	B	B	B	B	B	D	D	A
	0.033 333							A	A	A	A	A		A	A	A	B	B	B				N	N	N	N	A	A	A		B	B	B	B	B	B	A	A	A
	0.039 393							A	A	A	A	A		A	A	A	B	B	B				N	N	N	N	A	A	A		B	B	B	B	B	B	A	A	A
	0.047 473							A	A	A	A	A		A	A	A	B	B	B				N	N	N	N	A	A	A		B	B	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	A	A			B	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	A	A			B	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	A	A			B	B	B	B	B	D	A	A	
	0.12 124													A	A	A	B	B					N	N	N	E	A				B	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	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	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	H			
	1.0 105							A	A					B	B	B	B	C					A	A	A	A	A				H	H	H	H	H	H			
	2.2 225													B	B	C							A	A	A	A					H	H	H	H	H	H			
	4.7 475													C									A	A	A						H	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								

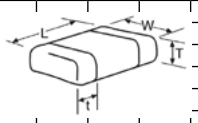
Case Size	01005 (KGM 02)	0201 (KGM03)	0402 (KGM05)		0603 (KGM15)			0805 (KGM21)				1206 (KGM31)							
Thickness Letter	A	A	A	C	A	B	C	B	N	E	A	B	V	M	T	P	D	A	H
Max Thickness (mm)	0.22	0.33	0.55	0.70	0.90	0.95	1.00	0.94	1.00	1.35	1.45	0.94	1.22	1.25	1.35	1.40	1.45	1.80	1.90
Carrier Tape	PAPER	PAPER	PAPER		PAPER	PAPER	PAPER	PAPER	PAPER	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											EMBOSSED (EMB)							

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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
(µF) 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	E	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	E	H	A	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	E	H	A	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	E	H	A	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	E	H	A	A	A	A	B	B	C	C	C	C	Z	Z	Z	Z	Z	D	D	D	D
0.068	683	R	R	R	R	R	H	P	A	A	A	A	B	F	C	C	C	C	Z	Z	Z	Z	Z	D	D	D	D
0.082	823	R	R	R	R	R	H	P	A	A	A	A	B	F	C	C	C	C	Z	Z	Z	Z	Z	D	D	D	D
0.100	104	R	R	R	R	R	H	P	A	A	A	B	B	F	C	C	C	C	Z	Z	Z	Z	Z	D	D	D	D
0.120	124	R	R	R	R	R	H		A	A	A	B	B	J	C	C	C	C	Z	Z	Z	Z	Z	D	D	D	D
0.150	154	E	E	E	E	E	L		A	A	A	B	F	J	C	C	C	C	Z	Z	Z	Z	Z	D	D	D	D
0.220	224	E	E	E	E	E	L		A	A	A	B	F	J	C	C	C	C	Z	Z	Z	Z	Z	D	D	D	D
0.330	334	E	E	E	E	H	L		A	A	A	B	F	J	C	C	C	C	Z	Z	Z	Z	Z	D	D	D	D
0.470	474	E	E	E	E	L	L		A	A	A	F	F	J	C	C	C	C	Z	Z	Z	Z	Z	D	D	D	D
0.680	684	E	E	E	E	L	L		F	F	F	F	J		C	C	C		Z	Z	Z	Z	C	D	D	D	G
1.000	105	E	E	E	G	L			F	F	F	F	J		C	C	C		Z	Z	Z	Z	D	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				J	J	J	J			C	F			Z	Z	Z			D	G		
10	106	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 (KGM56)	
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)																			

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