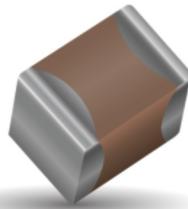


X7R Dielectric, KGM Series

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°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.

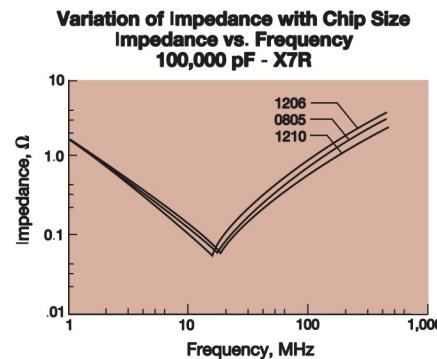
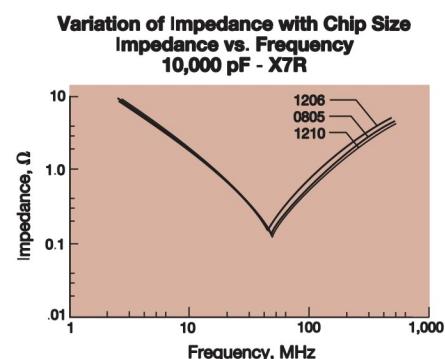
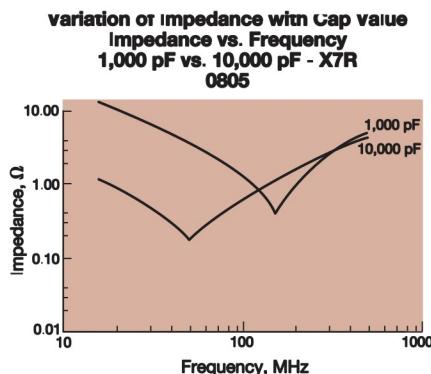
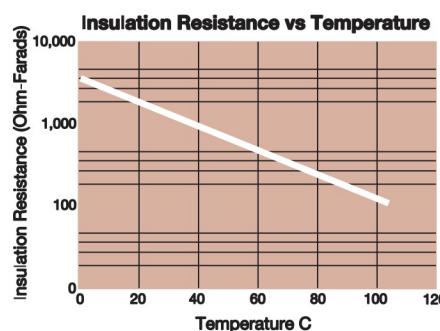
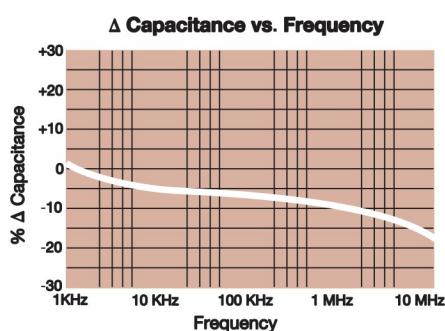
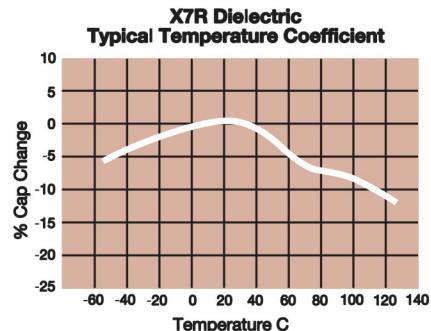
HOW TO ORDER

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

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

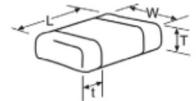
Specifications and Test Methods

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 specification		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.
	Capacitance Variation	≤ ±7.5%	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.
	Dissipation Factor / Tanδ	Within specification	(Pre-heating conditions) Order Temperature Time 1 80 to 100°C 2 minutes 2 150 to 200°C 2 minutes
	Insulation Resistance	Within specification	The charge and discharge current of the capacitor must not exceed 50mA for IR and withstand voltage measurement.
	Withstanding Voltage / Dielectric Strength	Resist without problem	
Thermal Shock	Appearance	No visual defects	Take the initial value after heat treatment. (Cycle)
	Capacitance Variation	≤ ±7.5%	Room temperature (3 min.) →> Lowest operation temperature (30 min.) →>
	Dissipation Factor	Within specification	Room temperature (3 min.) →> Highest operation temperature (30 min.)
	Insulation Resistance	Within specification	After 5 cycles, measure after heat treatment.
	Withstanding Voltage / Dielectric Strength	Resist without problem	The charge and discharge current of the capacitor must not exceed 50mA for IR and withstand voltage measurement.
Load Life	Appearance	No visual defects	Take the initial value after heat treatment.
	Capacitance Variation	≤ ±12.5%	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.
	Dissipation Factor / Tanδ	≤ Initial Value x 2.0 (See Above)	The charge and discharge current of the capacitor must not exceed 50mA for IR measurement.
	Insulation Resistance	Over 1000MΩ or 50MΩ · μF, whichever is less. *Exceptions Listed Below	*Apply 1.0 times when the rated voltage is 4V or less. Applied voltages for respective products are indicated in the chart below.
Load Humidity	Appearance	No visual defects	Take the initial value after heat treatment.
	Capacitance Variation	≤ ±12.5%	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.
	Dissipation Factor / Tanδ	Within specification	The charge and discharge current of the capacitor must not exceed 50mA for IR measurement.
	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.
	Capacitance	Within tolerance	Vibration frequency: 10 to 55 (Hz) Amplitude: 1.5mm
	Tanδ	Within tolerance	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.
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 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 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 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 N N N N N N N N	B B 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 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 N N N N N N N N	B B 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 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 N N N N N N N N	B B 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 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 N N N N N N N N	B B 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 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 N N N N N N N N	B B 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 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 N N N N N N N N	B B 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 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 N N N N N N N N	B B 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	A A A A A A A A A A A A A A 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 A A A A A A A A A A	B B 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	A A A A A A A A A A A A A A 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 A A A A A A A A A A	B B 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	A A A A A A A A A A A A A A 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 A A A A A A A A A A	B B 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	A A A A A A A A A A A A A A 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 A A A A A A A A A A	B B 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	A A A A A A A A A A A A A A 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 A A A A A A A A A A	B B 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	A A A A A A A A A A A A A A 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 A A A A A A A A A A	B B B B B B B B D D D
(μF) 0.012 123		A A A A A A A A A A A A A A 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 A A A A A A A A A A	B B B B B B B B D D D
0.015 153		A A A A A A A A A A A A A A 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 A A A A A A A A A A	B B B B B B B B D D D
0.018 183		A A A A A A A A A A A A A A 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 A A A A A A A A A A	B B 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 A A A A A 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 A A A A A A A A A A	B B B B B B B B D D A
0.027 273		A A A A A A A A A A A A A A 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 A A A A A A A A A A	B B B B B B B B D D A
0.033 333		A A A A A A A A A A A A A A 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 A A A A A A A A A A	B B B B B B B B A A A
0.039 393		A A A A A A A A A A A A A A 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 A A A A A A A A A A	B B B B B B B B A A A
0.047 473		A A A A A A A A A A A A A A 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 A A A A A A A A A A	B B B B B B B B A A A
0.068 683		A A A A A C	A A A A B B B		N N N N N A A A	B B B B B B B B D A A
0.082 823		A A A A A C	A A A A B B B		N N N N N A A A	B B B B B B B B D A A
0.1 104	A	A A A A A C	A A A A B B B		N N N N N A A A	B B B B B B B D A A
0.12 124		A A A A A C	A A A A B B B		N N N E A	B B B B B B D A A
0.15 154		A A A A A C	A A A A B B B		E E E E A	V V V M M A A A
0.22 224		A A A A A C	A B B B B B		A A A A A A	V V V M M A A A
0.33 334			B B B B B B		A A A A A A	V V V M P A
0.47 474		A A	B B B B B B		A A A A A A	H H H H H H A
0.68 684			B B B B		A A A A A A	H H H H H H H
1.0 105		A A	B B B B B C		A A A A A A	H H H H H H H
2.2 225			B B C		A A A A A A	H H H H H H H
4.7 475		C			A A A A	H H H A A A
10 106				A 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
Carrier Tape	PAPER	PAPER	PAPER	PAPER	PAPER	PAPER 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	T U U U U U
Packaging Code 13" reel	n/a	N	N N M M	M M M L	M L L L L L	EMBOSSED (EMB)
			PAPER			

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	25	50	100	200	500	50	100	200	500								
Cap 100 (pF) 151	R	R	R	R	R	R	D																																				
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	Z	Z	Z	D	D	D	D	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	Z	Z	Z	D	D	D	D	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	Z	Z	Z	D	D	D	D	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	Z	Z	Z	D	D	D	D	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	Z	Z	Z	D	D	D	D	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	Z	Z	Z	D	D	D	D	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	Z	Z	Z	D	D	D	D	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	Z	Z	Z	D	D	D	D	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	Z	Z	Z	D	D	D	D	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	Z	Z	Z	D	D	D	D	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	Z	Z	Z	D	D	D	D	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	Z	Z	Z	D	D	D	D	D	D	D	D										
0.022 223	R	R	R	R	R	R	E	E	A	A	A	A	B	C	C	C	C	Z	Z	Z	Z	Z	Z	Z	Z	D	D	D	D	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	Z	Z	Z	D	D	D	D	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	Z	Z	Z	D	D	D	D	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	Z	Z	Z	D	D	D	D	D	D	D	D										
0.047 473	R	R	R	R	R	R	E	H	A	A	A	A	B	B	C	C	C	Z	Z	Z	Z	Z	Z	Z	Z	D	D	D	D	D	D	D	D										
0.068 683	R	R	R	R	R	R	H	P	A	A	A	A	B	F	C	C	C	Z	Z	Z	Z	Z	Z	Z	Z	D	D	D	D	D	D	D	D										
0.082 823	R	R	R	R	R	R	H	P	A	A	A	A	B	F	C	C	C	Z	Z	Z	Z	Z	Z	Z	Z	D	D	D	D	D	D	D	D										
0.100 104	R	R	R	R	R	R	H	P	A	A	A	A	B	B	F	C	C	Z	Z	Z	Z	Z	Z	Z	Z	D	D	D	D	D	D	D	D										
0.120 124	R	R	R	R	R	R	H		A	A	A	A	B	B	J	C	C	Z	Z	Z	Z	Z	Z	Z	Z	D	D	D	D	D	D	D	D										
0.150 154	E	E	E	E	E	L		A	A	A	A	B	F	J	C	C	C	Z	Z	Z	Z	Z	Z	Z	Z	D	D	D	D	D	D	D	D										
0.220 224	E	E	E	E	E	L		A	A	A	A	B	F	J	C	C	C	Z	Z	Z	Z	Z	Z	Z	Z	D	D	D	D	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	Z	Z	Z	D	D	D	D	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	Z	Z	Z	D	D	D	D	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	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	Z	Z	Z	Z	D	D	D	D	D	D	D	D											
2.200 225	L	L	L	L	L			F	F	F	J		C	C	F	Z	Z	Z	Z	Z	Z	Z	Z	C	D	G	G	G	G	G	G	G											
4.700 475	L	L	L	L	L			J	J	J	J		C	F		Z	C	C	D	G					D	H																	
10 106	L	L	L	A				J	J	J	J		F	F		C	C	D	G																								
22 226	L	A	L																																								
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	25	50	100	200	500	50	100	200	500	50	100	200	500				
SIZE	1210								1812								1825								2220								2225										