



SYNTON-TECH CORPORATION

CHIP MULTILAYER CERAMIC CAPACITOR (AEC-Q200)

File No.:	CC-02—A- #H022
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- SUBJECT** : This specification applies on the chip capacitor was made by SYNTON-TECH Corporation ◦
- PART NUMBER** : Part number of the chip capacitor is identified by the size, dielectric, capacitance value, tolerance, voltage ◦

Example : **DESCRIPTION : 0402 NPO 100PF 50V J**

SYNTON CODE : 0402 NPO 101 J 50V

<u>SIZE</u>	<u>DIELECTRIC</u>	<u>CAPACITANCE</u>	<u>TOLERANCE</u>	<u>VOLTAGE</u>
0201	NPO	<u>VALUE</u>	10PF and below	6.3V
0402	X7R		B : ±0.10PF	10V
0603	X5R	3 Digits :	C : ±0.25PF	16V
0805	Y5V	5R1 : 5.1pF	D : ±0.5PF	25V
1206	Z5U	100 : 10pF		50V
1210		101 : 100pF	More than 10pF	100V
1808		102 : 1nF	F : ±1%	200V
1812		103 : 10nF	G : ±2%	250V
2220		104 : 0.1uF	J : ±5%	500V
		105 : 1uF	K : ±10%	630V
			M : ±20%	1KV
			Z : -20~+80%	2KV
				3KV

APPROVED	CHECKED	DESIGNED	REMARK	DOCUMENT NO.
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3. CAPACITOR CLASSIFICATION

Multi-layer ceramic capacitors are available in wide range of characteristics. Electronic Industries Association (EIA) and the military have established categories to help divide the basic characteristics into more easily specified classes. The basic industry specification for ceramic capacitor is EIA specification RS-198 and as noted in the general section, it specifies temperature-compensating capacitors as class I capacitors. These are specified by the military under specification MIL-C-20. General-purpose capacitors with non-linear temperature coefficients are called Class II capacitors by EIA and specified by military under MIL-C-11015 and MIL-C-39014. The new high reliability military specification, MIL-C-123 covers both class I and class II dielectrics.

Class I — Class I capacitors or temperature-compensating capacitors are usually made from mixtures of titanate where barium titanate is normally not a major part of mix. They have predictable temperature coefficients and in general, do not have an aging characteristic. Thus they are the most stable capacitor available. Normally the T.C.s of Class I temperature-compensating capacitors are NP0 (± 30 ppm/ $^{\circ}$ C).

Class II — General-purpose ceramic capacitors are called Class II capacitors and have become extremely popular because of the high capacitance values available in very small size. These capacitors are ferroelectrics and vary in capacitance value under the influence of the environmental and electrical operating conditions. Class II capacitors are affected by temperature, voltage, frequency and time. Temperature effects for Class II ceramic capacitors are exhibited as non-linear capacitance changes with temperature. Industry standards for Mid-K dielectrics, such as X7R, X5R and High-K dielectrics, such as Z5U and Y5V are defined as Class II formulations.



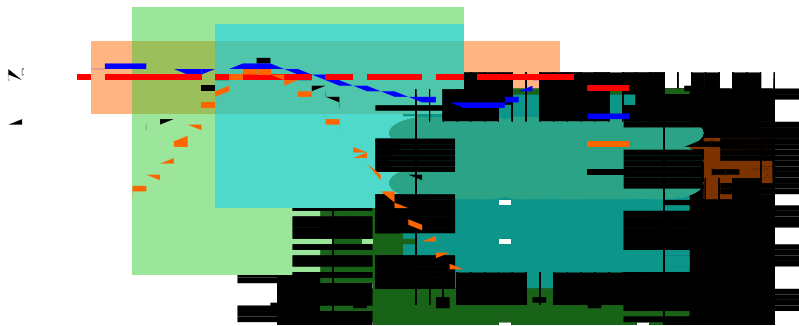
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4. MATERIALS AND PERFORMANCE CHARACTERIZATION

Designation	Class	Temperature Range (°C)	Temp-Cap Change
Temperature compensating NPO, COG	I	-55 ~ +125	± 30 ppm/°C
Intermediate K X7R, BX	II	-55 ~ +125	± 15 %
Intermediate K X5R	II	-55 ~ +85	± 15 %
High K Y5V	II	-25 ~ +85	+22 ~ -82 %
High K Z5U	II	+10 ~ +85	+22 ~ -56 %



The T.C curve of each material. (for reference)

5. TECHNOLOGY

Multi-layer ceramic capacitor constructed by depositing alternative layers of ceramic dielectric materials and internal metallic electrodes, by advanced ceramic manufacturing technology, and co-firing into an indestructible homogeneous body, then completed with application of metal end terminations which are fired on to assure that permanent connection of individual internal electrodes are in parallel.

The terminations also can be nickel-plated and then solder plated to give the chip capacitors nickel-barrier terminations which have much better leaching resistance during soldering.

Reliable performances are built-in through exact formulation of dielectric powders, preparation of conductive paste, advanced automatic manufacturing, and strict quality control to assure excellent control in dielectric thickness, electrode integrity, and electrode-to-termination continuity.



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6. ELECTRICAL CHARACTERISTICS

NPO

Characterizes	Test conditions	Requirement
Operation temp. range		-55°C ~ +125°C
Temp. coefficient (TC)	With respect to 25°C within operation temp. range	C<10pF, ±150ppm/°C C≥10pF, ±30ppm/°C
Capacitance tol.	Class I : (NPO)	In accordance with spec.
Dissipation Factor (Tan δ)	<1000pF 1.0±0.2Vrms, 1MHz±10% >1000pF 1.0±0.2Vrms, 1KHz±10%	C<10pF Tan δ ≤ 10(3/C+0.7) × 10E-4 or 30 × 10E-4 whichever is less C≥10pF Tan δ ≤ 10 × 10E-4
Insulation Resistance (IR)	Vr (rated voltage) ≤ 500V At Vr for 1 minute Vr (rated voltage) ≤ 500V At 500V for 1 minute	Rins > 100GΩ or Rins × C ≥ 500Ω-F whichever is less
Dielectric withstanding voltage	Vr (rated voltage) ≤ 100V At 2.5Vr for 5 seconds Vr (rated voltage) = 200/250V At 2.0Vr+100V for 5 seconds Vr (rated voltage) ≥ 500V At 1.5Vr for 5 seconds	No breakdown

X7R/X5R/Y5V

Characterizes	Test conditions	Requirement		
		X7R	X5R	Y5V
Operation temp. range		-55°C ~ +125°C	-25°C ~ +85°C	-25°C ~ +85°C
Temp. coefficient (TC)	X7R/X5R: With respect to 25°C within operation temp. range Y5V: With respect to 20°C within operation temp. range	±15%	±15%	+30% ~ -80%
Capacitance tol.		In accordance with spec.		
Dissipation Factor (Tan δ)	Class II : (X7R, X5R, Y5V) C ≤ 10uF 1.0±0.2Vrms, 1KHz±10% C > 10uF 0.5±0.2Vrms, 120Hz±20%	50V Tan δ ≤ 2.5% 25V/16V Tan δ ≤ 3.5% 10V Tan δ ≤ 5% 6.3V Tan δ ≤ 10%	50V Tan δ ≤ 2.5% 25V/16V Tan δ ≤ 3.5% 10V Tan δ ≤ 5% 6.3V Tan δ ≤ 10%	50V/25V Tan δ ≤ 5% 16V(C < 1uF) Tan δ ≤ 7% 16V(C ≥ 1uF) Tan δ ≤ 9% 10V Tan δ ≤ 12.5%
Insulation Resistance (IR)	Vr (rated voltage) ≤ 500V At Vr for 1 minute Vr (rated voltage) ≤ 500V At 500V for 1 minute	Rins > 10GΩ or R × C ≥ 100Ω - F Whichever is less	Rins > 10GΩ or R × C ≥ 100Ω - F Whichever is less	Rins > 10GΩ or R × C ≥ 100Ω - F Whichever is less



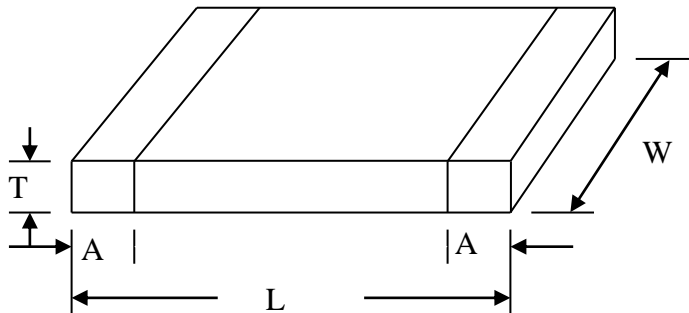
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Dielectric withstanding voltage	V_r (rated voltage) $\leq 100V$ At $2.5V_r$ for 5 seconds	No breakdown
	V_r (rated voltage) =200/250V At $2.0V_r+100V$ for 5 seconds	
	V_r (rated voltage) $\geq 500V$ At $1.5V_r$ for 5 seconds	

7. DIMENSION



Unit:mm

Case size	Length (L)	Width (W)	Thickness (T)	Termination length (A)
0201	0.60±0.03	0.30±0.03	0.30±0.03	0.10~0.20
0402	1.0±0.05	0.50±0.05	0.50±0.05	0.15~0.35
0603	1.6±0.15	0.80±0.15	0.65~0.95	0.25~0.65
0805	2.0±0.20	1.25±0.20	0.40~1.55	0.25~0.75
1206	3.2±0.30	1.60±0.30	0.50~1.95	0.35~0.85
1210	3.2±0.40	2.5±0.30	0.80~2.90	0.45~1.00
1808	4.6±0.40	2.00±0.30	1.00~2.90	0.45~1.00



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1812	4.6±0.40	3.20±0.30	1.00~3.20	0.45~1.00
2220	5.7±0.40	5.00±0.40	1.80~3.00	0.30~1.00

8. ENVIRONMENTAL AND TEST CHARACTERISTICS

Test item	Conditions	Requirements
Capacitance	NPO/X7R: measuring voltage 1 V at 25°C Y5V/Z5U: measuring voltage 1 V at 25°C C ≤ 1000 pF, f = 1 MHz; C > 1000 pF, f = 1 kHz;	Within specified tolerance
tan δ	Class I : (NPO) <1000pF 1.0±0.2Vrms, 1MHz±10% >1000pF 1.0±0.2Vrms, 1KHz±10% Class II : (X7R,X5R,Y5V) C ≤ 10uF 1.0±0.2Vrms, 1KHz±10% C > 10uF 0.5±0.2Vrms, 120Hz±20%	In accordance with specification
Insulation resistance	To apply rated voltage for max. 120sec.	10GΩ or RxC ≥ 500Ω-F whichever is smaller. Class II (X5R, X7R, Y5V) Rated voltage* 10V:0603>0.47uF; 0805>2.2uF 1206>4.7uF * 6.3V Insulation Resistance ≥ 100Ω-F
	Rated voltage: 200~630V To apply rated voltage(500V max) for 60sec	≥ 10GΩ OR 100Ω-F whichever is smaller.
	Rated voltage: >630V To apply 500V for 60 sec	≥ 10GΩ OR 100Ω-F whichever is smaller.
Voltage proof	Vr (rated voltage) ≤ 100V At 2.5Vr for 5 seconds, 50mA Vr (rated voltage) = 200/250V At 1.5Vr+100V for 5 seconds, 50mA Vr (rated voltage) ≥ 500V At 1.2Vr for 5 seconds, 50mA	No breakdown No flashover
Adhesive Strength of Termination	Pressurizing force:0201:2N 0402&0603:5N >0603:10N* test time: 10 ± 1 sec.	No visible damage



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Bending Test	<p>*The middle part of substrate shall be pressurized by means of the pressurizing rod at a rate of about 1 mm per second until the deflection becomes 1 mm and then the pressure shall be maintained for 5 ± 1 sec.</p> <p>*Measurement to be made after keeping at room temp. for 24 ± 2 hrs.</p>	<p>No remarkable damage.</p> <p>Cap change: NPO: within ± 5.0 % or ± 0.5 pF whichever is larger. X7R, X5R : within ± 12.5 % Y5V: within ± 30 % (This capacitance change means the change of capacitance under specified flexure of substrate from the capacitance measured before the test.)</p>
Resistance to soldering heat	$260 \pm 5^\circ\text{C}$ for $10 + 0.5$ s	<p>The terminations must be well tinned, after recovery.</p> <p>NPO: $\Delta C/C \leq 25$ % or ± 0.25 pF whichever is larger. X7R/X5R: Within ± 7.5 % Y5V: Within ± 20 %</p>
Resistance to leaching	$260 \pm 5^\circ\text{C}$ for 30 ± 1 s in static solder bath	With visual enlargement of x 10, dissolution of the terminations should not exceed 10 %
Solderability	Zero hour test, and test after storage (20 to 24 months) in original atmosphere in normal atmosphere; un-mounted chips completely immersed for 2 ± 0.5 s in a solder bath of $235 \pm 5^\circ\text{C}$.	95% Min. coverage of all metalized area.
Temperature Cycle	<p>NPO/X7R: -55°C to $+125^\circ\text{C}$, 5 cycle Y5V: -25°C to $+85^\circ\text{C}$, 5 cycle X5R: -55°C to $+85^\circ\text{C}$, 5 cycle Duration: 30 mins. Recovery: 24 ± 2 hrs.</p>	<p>No visible damage after 24 hrs recovery Class I NPO: $\Delta C/C \leq 2.5$ % or 0.25 pF X7R/X5R: $\Delta C/C \leq \pm 7.5$ % Y5V/Z5U: $\Delta C/C \leq \pm 20$ %</p>



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**Humidity
(Steady State)**

Test temp.: 40±2°C
 Humidity : 90 to 95 % RH
 Test time 500+24/-0hrs.
 Measurement to be made after keeping at
 room temp. for 24±2 hrs.(ClassI) or 48±4
 hrs.(ClassII).

No remarkable damage.

Cap change:

NPO: within ±5.0% or ±0.5pF whichever is larger.
 X7R/X5R: ≥10V, within ±12.5%, 6.3V, within ±25%

TT series & Cap ≥1uF, within ±25%

Y5V: ≥10V, within ±30%, 6.3V, within +30/-40%

Q/D. F. value :

NPO: More then 30pF Q ≥350, 10pF ≤ C < 30pF,
 Q ≥ 275 + 2.5C

Less than 10pF Q ≥ 200 + 10C

X7R/X5R:

Rated vol.	D.F. ≤	Exception D.F. ≤	
≥50V	≤3%	≤6%	0201(50V) 0603 ≥ 0.047uF 0805 ≥ 0.18uF 1206 ≥ 0.47uF
35V	≤5%	≤20%	0603 ≥ 1.0uF 0805 & 1206 ≥ 2.2uF 1210 ≥ 10uF
25V	≤5%	≤10%	0805 ≥ 1uF 1210 ≥ 10uF
		≤14%	0603 ≥ 0.33uF 1206 ≥ 4.7uF
		≤15%	0603 ≥ 0.47uF 0805 ≥ 2.2uF 1206 ≥ 6.8uF
16V	≤5%	≤10%	0603 ≥ 0.15uF 0805 ≥ 0.68uF 1206 ≥ 2.2uF 1210 ≥ 4.7uF
		≤15%	0603 ≥ 0.68uF 0805 ≥ 2.2uF 1206 ≥ 4.7uF
10V	≤7.5%	≤15%	0603 ≥ 0.33uF 0805 ≥ 2.2uF 1206 ≥ 2.2uF 1210 ≥ 22uF
6.3V	≤15%	≤30%	0402 ≥ 1.0uF 0603 ≥ 10uF 0805 ≥ 4.7uF 1210 ≥ 100uF



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Y5V:			
Rated vol.	D.F.≤	Exception D.F.≤	
≥50V	≤7.5%	≤10%	0603≥0.1uF; 0805≥0.47uF;
35V	≤10%		
25V	≤7.5%	≤10%	0402≥0.047uF; 0603≥0.1uF; 0805≥0.33uF; 1206≥1uF; 1210≥4.7uF;
		≤15%	0402≥0.068uF; 0603≥0.47uF; 1206≥4.7uF;
16V (C<1.0uF)	≤10%	≤125%	0402≥0.068uF; 0603≥0.68uF;
16V (C<1.0uF)	≤125%	≤20%	0805≥4.7uF; 1206≥10uF; 1210≥22uF; 1812≥47uF; TT series&Cap≥1uF
10V	≤20%		
6.3V	≤30%		

*I.R.:≥10V 1GΩ or 50Ω-F whichever is smaller
6.3V 1GΩ-F



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High Temperature Load (Endurance)

Test temp.:
 NPO,X7R:125±3°C
 X5R,Y5V :85±3°C
To apply voltage:
 (1)6.3V or C≥10uF(for X7R,X5R):
 150% of rated voltage,
 (2)6.3V<V<500V and C<10uF
 (for X7R,X5R):200% of rated voltage,
 (3)500V:150% of rated voltage,
 (4)V≥630V:120% of rated voltage,

Test time: 1000+24/-0hrs.
 Measurement to be made after keeping at room temp. for 24±2 hrs.(ClassI) or 48±4 hrs.(ClassII).

No remarkable damage.
Cap change:
 NPO: within ±3.0% or ±0.3pF whichever is larger.
 X7R/X5R:≥10V,within ±12.5%,6.3V,within ±25%
 TT series & Cap≥1uF, within ±25%
 Y5V:≥10V, within ±30%, 6.3V, within +30 to -40%
Q/D.F. value:
 NPO: Cap≥ 30pF, Q≥350,
 10pF≤Cap<30pF, Q≥275+2.5C
 Cap<10pF, Q≥200+10C

X7R/X5R:

Rated vol.	D.F.≤	Exception D.F.≤
≥50V	≤3%	≤6% 0201(50V); 0603≥0.047uF; 0805≥0.18uF; 1206≥0.47uF;
35V	≤5%	
25V	≤5%	≤10% 0805≥1uF; 1206≥1uF; 1210≥10uF;
		≤14% 0402≥0.10uF; 0603≥0.33uF; 0805≥2.2uF; 1206≥4.7uF; TT series&Cap≥1uF
		≤15% 0603≥0.68uF; 0805≥4.7uF; 1206≥6.8uF;
16V	≤5%	≤10% 0402≥0.033uF; 0603≥0.15uF; 0805≥0.68uF; 1206≥2.2uF; 1210≥4.7uF; TT series&Cap≥1uF
		≤15% 0603≥0.68uF; 0805≥2.2uF; 1206≥6.8uF; 1210≥22uF; TT series&Cap≥1uF
10V	≤7.5%	≤15% 0603≥0.33uF; 0805≥2.2uF; 1206≥2.2uF; 1210≥22uF; TT series&Cap≥1uF
6.3V	≤15%	≤30% 0402≥2.2uF; 0603≥10uF; 0805≥10uF; 1210≥100uF; TT series&Cap≥1uF



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Y5V:

Rated vol.	D.F.≤	Exception D.F.≤	
25V	≤7.5%	≤10%	0402≥0.047uF; 0603≥0.1uF; 0805≥0.33uF; 1206≥1uF; 1210≥4.7uF;
		≤15%	0402≥0.068uF; 0603≥0.47uF; 1206≥4.7uF;
16V (C<1.0uF)	≤10%	≤125%	0402≥0.068uF; 0603≥0.68uF;
16V (C<1.0uF)	≤125%	≤20%	0805≥3.3uF; 1206≥10uF; 1210≥22uF; 1812≥47uF; TT series&Cap≥1uF
10V	≤20%		
6.3V	≤30%		

*I.R.:≥10V 1GΩ or 50Ω-F whichever is smaller
6.3V 1GΩ-F



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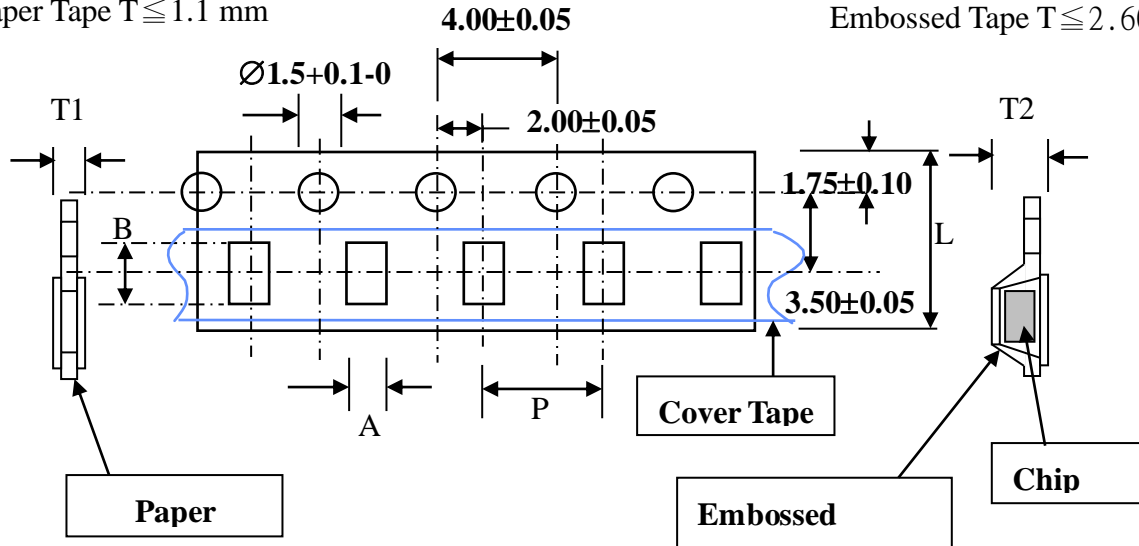
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9. PACKING

Paper Tape $T \leq 1.1$ mm

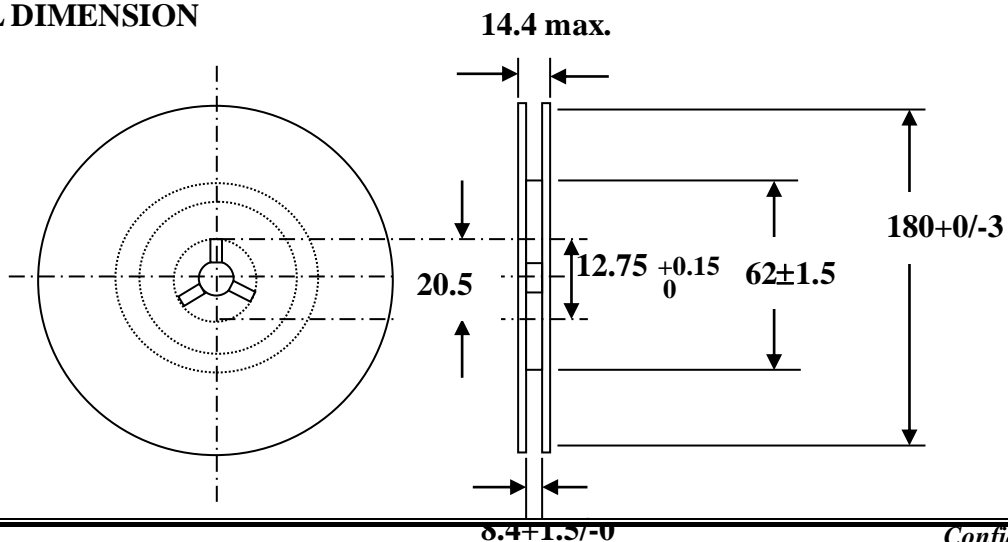
Embossed Tape $T \leq 2.60$



Unit:mm

Symbol	Pocket Size Code								
	0201	0402	0603	0805	1206	1210	1808	1812	2220
A	0.37±0.03	0.62±0.05	1.10±0.10	1.65±0.05	2.00±0.10	2.80±0.20	2.50±0.30	3.60±0.30	MAX5.8
B	0.67±0.03	1.12±0.05	1.90±0.10	2.40±0.05	3.50±0.10	3.70±0.20	4.90±0.30	4.90±0.30	MAX6.5
P	2.00±0.05	2.00±0.05	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	8.00±0.10	8.00±0.10
L	8.00±0.20	8.00±0.20	8.00±0.20	8.00±0.20	8.00±0.20	8.00±0.20	12.0±0.20	12.0±0.20	12.0±0.20
T1	0.42±0.03	0.60±0.05	1.00±0.05	1.00±0.05	1.00±0.05	—	—	—	—
T2	—	—	—	—	—	2.00±0.1	2.50±0.1	2.50±0.1	MAX3.2

REEL DIMENSION





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10. CAPACITANCE RANGE

NPO

CAP CODE	SIZE VDCW	0201											
		10	16	25	50								
0R1~9R0	0.1pF ~ 9pF		L	L	L								
100	10pF		L	L	L								
120	12pF		L	L	L								
150	15pF		L	L	L								
180	18pF		L	L	L								
220	22pF		L	L	L								
270	27pF		L	L	L								
330	33pF		L	L	L								
390	39pF		L	L	L								
470	47pF		L	L	L								
560	56pF		L	L	L								
680	68pF		L	L	L								
820	82pF		L	L	L								
101	100pF		L	L	L								
121	120pF		L	L	L								

NPO

CAP CODE	SIZE VDCW	0402				0603				0805			
		10	16	25	50	10	16	25	50	10	16	25	50
0R1	0.1pF	N	N	N	N								
0R2	0.2pF	N	N	N	N								
0R3	0.3pF	N	N	N	N	S	S	S	S				
0R4	0.4pF	N	N	N	N	S	S	S	S				
R47	0.47pF								S				A
0R5~9R0	0.5pF ~ 9.0pF	N	N	N	N	S	S	S	S	A	A	A	A
100	10pF	N	N	N	N	S	S	S	S	A	A	A	A
120	12pF	N	N	N	N	S	S	S	S	A	A	A	A
150	15pF	N	N	N	N	S	S	S	S	A	A	A	A
160	16pF					S	S	S	S				
180	18pF	N	N	N	N	S	S	S	S	A	A	A	A
200	20pF	N	N	N	N	S	S	S	S	A	A	A	A
220	22pF	N	N	N	N	S	S	S	S	A	A	A	A
240	24pF	N	N	N	N	S	S	S	S	A	A	A	A
270	27pF	N	N	N	N	S	S	S	S	A	A	A	A
300	30pF	N	N	N	N	S	S	S	S	A	A	A	A
330	33pF	N	N	N	N	S	S	S	S	A	A	A	A
390	39pF	N	N	N	N	S	S	S	S	A	A	A	A
470	47pF	N	N	N	N	S	S	S	S	A	A	A	A
510	51pF	N	N	N	N	S	S	S	S	A	A	A	A



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560	56pF	N	N	N	N	S	S	S	S	A	A	A	A
620	62pF	N	N	N	N	S	S	S	S	A	A	A	A
680	68pF	N	N	N	N	S	S	S	S	A	A	A	A
820	82pF	N	N	N	N	S	S	S	S	A	A	A	A
101	100pF	N	N	N	N	S	S	S	S	A	A	A	A
121	120pF	N	N	N	N	S	S	S	S	A	A	A	A
151	150pF	N	N	N	N	S	S	S	S	A	A	A	A
181	180pF	N	N	N	N	S	S	S	S	A	A	A	A
201	200pF	N	N	N	N	S	S	S	S	A	A	A	A
221	220pF	N	N	N	N	S	S	S	S	A	A	A	A
271	270pF	N	N	N	N	S	S	S	S	A	A	A	A
301	300pF	N	N	N	N	S	S	S	S	A	A	A	A
331	330pF	N	N	N	N	S	S	S	S	A	A	A	A
391	390pF	N	N	N	N	S	S	S	S	B	B	B	B
471	470pF	N	N	N	N	S	S	S	S	B	B	B	B
561	560pF	N	N	N	N	S	S	S	S	B	B	B	B
681	680pF	N	N	N	N	S	S	S	S	B	B	B	B
821	820pF	N	N	N	N	S	S	S	S	B	B	B	B
911	910pF	N	N	N	N	S	S	S	S	B	B	B	B
102	1000pF (1 nF / 0.001 uF)	N	N	N	N	S	S	S	S	B	B	B	B
122	1200pF(1.2 nF / 0.0012 uF)					X	X	X	X	B	B	B	B
152	1500pF(1.5 nF / 0.0015 uF)					X	X	X	X	B	B	B	B
182	1800pF(1.8 nF / 0.0018 uF)					X	X	X	X	B	B	B	B
222	2200pF(2.2 nF / 0.0022 uF)					X	X	X	X	B	B	B	B
272	2700pF(2.7 nF / 0.0027 uF)					X	X	X	X	D	D	D	D
332	3300pF(3.3 nF / 0.0033 uF)					X	X	X	X	D	D	D	D
392	3900pF(3.9 nF / 0.0039 uF)					X	X	X	X	D	D	D	D
472	4700pF(4.7 nF / 0.0047 uF)					X	X	X	X	D	D	D	D
562	5600pF(5.6 nF / 0.0056 uF)					X	X	X	X	D	D	D	D
682	6800pF(6.8 nF / 0.0068 uF)					X	X	X	X	D	D	D	D
822	8200pF(8.2 nF / 0.0082 uF)					X	X	X	X	D	D	D	D
103	10000pF (10 nF / 0.01 uF)					X	X	X	X	D	D	D	D
123	12000pF (12 nF / 0.012 uF)									T	T	T	T
153	15000pF (15 nF / 0.015 uF)									T	T	T	T
183	18000pF (18 nF / 0.018 uF)									D	D	D	D
223	22000pF (22 nF / 0.022 uF)									D	D	D	D

NPO

CAP CODE	SIZE VDCW	1206				1210				1812			
		10	16	25	50	10	16	25	50	16	25	50	
1R2~8R2	1.2pF ~ 8.2pF	B	B	B	B								
100	10pF	B	B	B	B	C	C	C	C	D	D	D	
120	12pF	B	B	B	B	C	C	C	C	D	D	D	
150	15pF	B	B	B	B	C	C	C	C	D	D	D	
180	18pF	B	B	B	B	C	C	C	C	D	D	D	
200	20pF	B	B	B	B	C	C	C	C	D	D	D	
220	22pF	B	B	B	B	C	C	C	C	D	D	D	



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240	24pF	B	B	B	B	C	C	C	C	D	D	D
270	27pF	B	B	B	B	C	C	C	C	D	D	D
300	30pF	B	B	B	B	C	C	C	C	D	D	D
330	33pF	B	B	B	B	C	C	C	C	D	D	D
390	39pF	B	B	B	B	C	C	C	C	D	D	D
470	47pF	B	B	B	B	C	C	C	C	D	D	D
510	51pF	B	B	B	B	C	C	C	C	D	D	D
560	56pF	B	B	B	B	C	C	C	C	D	D	D
620	62pF	B	B	B	B	C	C	C	C	D	D	D
680	68pF	B	B	B	B	C	C	C	C	D	D	D
820	82pF	B	B	B	B	C	C	C	C	D	D	D
101	100pF	B	B	B	B	C	C	C	C	D	D	D
121	120pF	B	B	B	B	C	C	C	C	D	D	D
151	150pF	B	B	B	B	C	C	C	C	D	D	D
181	180pF	B	B	B	B	C	C	C	C	D	D	D
221	220pF	B	B	B	B	C	C	C	C	D	D	D
271	270pF	B	B	B	B	C	C	C	C	D	D	D
301	300pF	B	B	B	B	C	C	C	C	D	D	D
331	330pF	B	B	B	B	C	C	C	C	D	D	D
391	390pF	B	B	B	B	C	C	C	C	D	D	D
471	470pF	B	B	B	B	C	C	C	C	D	D	D
561	560pF	B	B	B	B	C	C	C	C	D	D	D
681	680pF	B	B	B	B	C	C	C	C	D	D	D
821	820pF	B	B	B	B	C	C	C	C	D	D	D
911	910pF	B	B	B	B	C	C	C	C	D	D	D
102	1000pF (1 nF / 0.001 uF)	B	B	B	B	C	C	C	C	D	D	D
122	1200pF(1.2 nF / 0.0012 uF)	B	B	B	B	C	C	C	C	D	D	D
152	1500pF(1.5 nF / 0.0015 uF)	B	B	B	B	C	C	C	C	D	D	D
182	1800pF(1.8 nF / 0.0018 uF)	B	B	B	B	C	C	C	C	D	D	D
222	2200pF(2.2 nF / 0.0022 uF)	B	B	B	B	C	C	C	C	D	D	D
272	2700pF(2.7 nF / 0.0027 uF)	B	B	B	B	C	C	C	C	D	D	D
332	3300pF(3.3 nF / 0.0033 uF)	B	B	B	B	C	C	C	C	D	D	D
392	3900pF(3.9 nF / 0.0039 uF)	B	B	B	B	C	C	C	C	D	D	D
472	4700pF(4.7 nF / 0.0047 uF)	B	B	B	B	C	C	C	C	D	D	D
562	5600pF(5.6 nF / 0.0056 uF)	B	B	B	B	C	C	C	C	D	D	D
682	6800pF(6.8 nF / 0.0068 uF)	C	C	C	C	C	C	C	C	D	D	D
822	8200pF(8.2 nF / 0.0082 uF)	D	D	D	D	C	C	C	C	D	D	D
103	10000pF (10 nF / 0.01 uF)	D	D	D	D	C	C	C	C	D	D	D
123	12000pF (12 nF / 0.012 uF)	P	P	P	P	D	D	D	D	D	D	D
153	15000pF (15 nF / 0.015 uF)	P	P	P	P	D	D	D	D	D	D	D
183	18000pF (18 nF / 0.018 uF)	P	P	P	P	K	K	K	K	D	D	D
223	22000pF (22 nF / 0.022 uF)	P	P	P	P	K	K	K	K	D	D	D
273	27000pF (27 nF / 0.027 uF)	P	P	P	P	K	K	K	K	D	D	D
333	33000pF (33 nF / 0.033 uF)	P	P	P	P	K	K	K	K	D	D	D
393	39000pF (39 nF / 0.039 uF)	P	P	P	P					M	M	M
473	47000pF (47 nF / 0.047 uF)	J	J	J	J					M	M	M
563	56000pF (56 nF / 0.056 uF)	J	J	J	J					M	M	M
683	68000pF (68 nF / 0.068 uF)	G	G	G	G					M	M	M



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823	82000pF (82 nF / 0.082 uF)	G	G	G	G						M	M	M	
104	100000pF (100 nF / 0.1 uF)	G	G	G	G						M	M	M	

NPO (Hi-voltage)

CAP CODE	SIZE VDCW	0402	0603				0805					1206					
		100	100	200	250	100	200	250	500	630	100	200	250	500	630	1000	2000
0R5~1R2	0.5pF ~ 1.2pF	N	S	S	S	A	A	A	A	A							
1R5~8R2	1.5pF ~ 8.2pF	N	S	S	S	A	A	A	A	A	B	B	B	B	B	B	B
100	10pF	N	S	S	S	A	A	A	A	A	B	B	B	B	B	B	B
120	12pF	N	S	S	S	A	A	A	A	A	B	B	B	B	B	B	B
150	15pF	N	S	S	S	A	A	A	A	A	B	B	B	B	B	B	B
180	18pF	N	S	S	S	A	A	A	A	A	B	B	B	B	B	B	B
200	20pF	N	S	S	S	A	A	A	A	A	B	B	B	B	B	B	B
220	22pF	N	S	S	S	A	A	A	A	A	B	B	B	B	B	B	B
240	24pF	N	S	S	S	A	A	A	A	A	B	B	B	B	B	B	B
270	27pF	N	S	S	S	A	A	A	A	A	B	B	B	B	B	B	B
300	30pF	N	S	S	S	A	A	A	A	A	B	B	B	B	B	B	B
330	33pF	N	S	S	S	A	A	A	A	A	B	B	B	B	B	B	C
390	39pF	N	S	S	S	A	A	A	A	A	B	B	B	B	B	B	C
470	47pF	N	S	S	S	A	A	A	A	A	B	B	B	B	B	C	C
560	56pF	N	S	S	S	A	A	A	A	A	B	B	B	B	B	C	D
680	68pF	N	S	S	S	A	A	A	A	A	B	B	B	B	B	C	D
820	82pF	N	S	S	S	A	A	A	B	B	B	B	B	B	B	D	D
101	100pF	N	S	S	S	A	A	B	B	B	B	B	B	B	B	D	D
121	120pF	N	S	S	S	A	A	B	D	D	B	B	B	B	B	D	G
151	150pF	N	S	S	S	A	B	D	D	D	B	B	B	B	B	D	G
181	180pF	N	S	S	S	A	B	D	D	D	B	B	B	B	B	G	G
221	220pF	N	S	S	S	A	D	D	D	D	B	B	B	B	B	G	G
271	270pF		S	X	X	A	D	D	D	D	B	B	C	C	C	G	P
331	330pF		S	X	X	A	D	D	D	D	B	B	C	C	C	G	P
391	390pF		S	X	X	B	D	D	D	D	B	B	C	C	C	G	P
471	470pF		S	X	X	B	D	D	I	I	B	C	C	C	C	G	
561	560pF		S			B	D	D	I	I	B	C	D	D	D	G	
681	680pF		S			B	D	D	I	I	B	C	D	D	D	G	
821	820pF		S			B	D	D	I	I	B	C	G	G	G	G	
102	1000pF (1 nF / 0.001 uF)		S			B	D	D	I	I	B	C	G	G	G	G	
122	1200pF(1.2 nF / 0.0012 uF)		X			B	D	D			B	C	G	G	G		
152	1500pF(1.5 nF / 0.0015 uF)		X			B	D	D			B	D	G	G	G		
182	1800pF(1.8 nF / 0.0018 uF)					B	D	D			B	D	G	G	G		
222	2200pF(2.2 nF / 0.0022 uF)					B	D	D			B	D	G	G	G		
272	2700pF(2.7 nF / 0.0027 uF)					D					B	D	G				
332	3300pF(3.3 nF / 0.0033 uF)					D					B	D	G				
392	3900pF(3.9 nF / 0.0039 uF)					D					B	D	G				
472	4700pF(4.7 nF / 0.0047 uF)					D					B	D	G				
562	5600pF(5.6 nF / 0.0056 uF)					D					B						
682	6800pF(6.8 nF / 0.0068 uF)					D					C						
822	8200pF(8.2 nF / 0.0082 uF)										D						



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103	10000pF (10 nF / 0.01 uF)																					D
123	12000pF (12 nF / 0.012 uF)																					P
153	15000pF (15 nF / 0.015 uF)																					P
183	18000pF (18 nF / 0.018 uF)																					P
223	22000pF (22 nF / 0.022 uF)																					P

NPO (High-voltage)

CAP CODE	SIZE VDCW	1210							1808			1812								
		100	200	250	500	630	1000	2000	1000	2000	3000	100	200	250	500	630	1000	2000	3000	
2R0~2R7	2.0pF ~ 2.7pF								D	D	D									
3R3~8R2	3.3pF ~ 8.2pF								D	D	D									
100	10pF	C	C	C	C	C	C	C	D	D	D	D	D	D	D	D	D	D	D	
120	12pF	C	C	C	C	C	C	C	D	D	D	D	D	D	D	D	D	D	D	
150	15pF	C	C	C	C	C	C	C	D	D	D	D	D	D	D	D	D	D	D	
180	18pF	C	C	C	C	C	C	C	D	D	D	D	D	D	D	D	D	D	D	
200	20pF	C	C	C	C	C	C	C	D	D	D	D	D	D	D	D	D	D	D	
220	22pF	C	C	C	C	C	C	C	D	D	D	D	D	D	D	D	D	D	D	
240	24pF	C	C	C	C	C	C	C	D	D	D	D	D	D	D	D	D	D	D	
270	27pF	C	C	C	C	C	C	C	D	D	D	D	D	D	D	D	D	D	D	
300	30pF	C	C	C	C	C	C	C	D	D	D	D	D	D	D	D	D	D	D	
330	33pF	C	C	C	C	C	C	C	D	D	D	D	D	D	D	D	D	D	D	
390	39pF	C	C	C	C	C	C	C	D	D	D	D	D	D	D	D	D	D	D	
470	47pF	C	C	C	C	C	C	C	D	D	D	D	D	D	D	D	D	D	D	
510	51pF	C	C	C	C	C			D	D	D	D	D	D	D	D	D	D	D	
560	56pF	C	C	C	C	C	C	D	D	D	D	D	D	D	D	D	D	D	D	
680	68pF	C	C	C	C	C	C	D	D	D	D	D	D	D	D	D	D	D	D	
820	82pF	C	C	C	C	C	C	D	D	D	D	D	D	D	D	D	D	D	D	
101	100pF	C	C	C	C	C	D	D	D	K	K	D	D	D	D	D	D	D	D	
121	120pF	C	C	C	C	C	D	D	D	K	K	D	D	D	D	D	D	D	D	
151	150pF	C	C	C	C	C	D	G	D	K	K	D	D	D	D	D	D	D	D	
181	180pF	C	C	C	C	C	D	G	D	K	K	D	D	D	D	D	D	D	K	K
221	220pF	C	C	C	C	C	G	G	D	K	K	D	D	D	D	D	D	D	K	K
271	270pF	C	C	C	C	C	G	K	K	K	K	D	D	D	D	D	D	D	K	K
331	330pF	C	C	C	C	C	G	K	K	K	K	D	D	D	D	D	D	D	K	K
391	390pF	C	C	C	C	C	G	M	K	K		D	D	D	D	D	D	D	K	K
471	470pF	C	C	C	C	C	G	M	K	K		D	D	D	D	D	D	D	K	K
561	560pF	C	C	C	C	C	G		K	K		D	D	D	D	D	D	D	K	
681	680pF	C	C	C	C	C	G		K	K		D	D	D	D	D	D	D	K	
821	820pF	C	C	C	C	C	G		K			D	D	D	D	D	D	D	K	
102	1000pF (1 nF / 0.001 uF)	C	D	D	D	D	G		K			D	D	D	D	D	D	K	K	
122	1200pF(1.2 nF / 0.0012 uF)	C	D	D	D	D						D	D	D	D	D	D	K		
152	1500pF(1.5 nF / 0.0015 uF)	C	D	D	D	D						D	D	D	D	D	D	K		
182	1800pF(1.8 nF / 0.0018 uF)	C	D	D	D	D						D	D	D	D	D				
222	2200pF(2.2 nF / 0.0022 uF)	C	D	D	D	D						D	D	D	D	D				
272	2700pF(2.7 nF / 0.0027 uF)	C	D	D	D	D						D	D	D	D	D				
332	3300pF(3.3 nF / 0.0033 uF)	C	D	D	D	D						D	D	D	D	D				
392	3900pF(3.9 nF / 0.0039 uF)	C	D	D	D	D						D	D	D						
472	4700pF(4.7 nF / 0.0047 uF)	C	G	G								D	D	D						
562	5600pF(5.6 nF / 0.0056 uF)	C	G	G								D	D	D						



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682	6800pF(6.8 nF / 0.0068 uF)	C	G	G								D	D	D				
822	8200pF(8.2 nF / 0.0082 uF)	C	G	G								D						
103	10000pF (10 nF / 0.01 uF)	C	G	G								D						
123	12000pF (12 nF / 0.012 uF)	D										D						
153	15000pF (15 nF / 0.015 uF)	D										D						
183	18000pF (18 nF / 0.018 uF)	K										D						
223	22000pF (22 nF / 0.022 uF)	K										D						
273	27000pF (27 nF / 0.027 uF)	K										D						
333	33000pF (33 nF / 0.033 uF)	K										D						
393	39000pF (39 nF / 0.039 uF)											M						
473	47000pF (47 nF / 0.047 uF)											M						
563	56000pF (56 nF / 0.056 uF)											M						
683	68000pF (68 nF / 0.068 uF)											M						
823	82000pF (82 nF / 0.082 uF)											M						
104	100000pF (100 nF / 0.1 uF)											M						



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CAP CODE	SIZE VDCW	0201											
		10	16	25	50								
101	100pF		L	L	L								
121	120pF		L	L	L								
151	150pF		L	L	L								
181	180pF		L	L	L								
221	220pF		L	L	L								
271	270pF		L	L	L								
331	330pF		L	L	L								
391	390pF		L	L	L								
471	470pF		L	L	L								
561	560pF		L	L	L								
681	680pF		L	L	L								
821	821pF		L	L	L								
102	1000pF (1 nF / 0.001 uF)	L	L	L	L								
122	1200pF(1.2 nF / 0.0012 uF)	L	L	L									
152	1500pF(1.5 nF / 0.0015 uF)	L	L	L									
182	1800pF(1.8 nF / 0.0018 uF)	L	L										
222	2200pF(2.2 nF / 0.0022 uF)	L	L										
272	2700pF(2.7 nF / 0.0027 uF)	L	L										
332	3300pF(3.3 nF / 0.0033 uF)	L	L										
392	3900pF(3.9 nF / 0.0039 uF)	L	L										
472	4700pF(4.7 nF / 0.0047 uF)	L	L										
562	5600pF(5.6 nF / 0.0056 uF)	L											
682	6800pF(6.8 nF / 0.0068 uF)	L											
822	8200pF(8.2 nF / 0.0082 uF)	L											
103	10 nF (0.01 uF)	L	L										



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CAP CODE	SIZE VDCW	0402				0603				0805			
		10	16	25	50	10	16	25	50	10	16	25	50
101	100pF	N	N	N	N	S	S	S	S	B	B	B	B
121	120pF	N	N	N	N	S	S	S	S	B	B	B	B
151	150pF	N	N	N	N	S	S	S	S	B	B	B	B
181	180pF	N	N	N	N	S	S	S	S	B	B	B	B
221	220pF	N	N	N	N	S	S	S	S	B	B	B	B
271	270pF	N	N	N	N	S	S	S	S	B	B	B	B
331	330pF	N	N	N	N	S	S	S	S	B	B	B	B
391	390pF	N	N	N	N	S	S	S	S	B	B	B	B
471	470pF	N	N	N	N	S	S	S	S	B	B	B	B
561	560pF	N	N	N	N	S	S	S	S	B	B	B	B
681	680pF	N	N	N	N	S	S	S	S	B	B	B	B
821	821pF	N	N	N	N	S	S	S	S	B	B	B	B
102	1000pF (1 nF / 0.001 uF)	N	N	N	N	S	S	S	S	B	B	B	B
122	1200pF(1.2 nF / 0.0012 uF)	N	N	N	N	S	S	S	S	B	B	B	B
152	1500pF(1.5 nF / 0.0015 uF)	N	N	N	N	S	S	S	S	B	B	B	B
182	1800pF(1.8 nF / 0.0018 uF)	N	N	N	N	S	S	S	S	B	B	B	B
222	2200pF(2.2 nF / 0.0022 uF)	N	N	N	N	S	S	S	S	B	B	B	B
272	2700pF(2.7 nF / 0.0027 uF)	N	N	N	N	S	S	S	S	B	B	B	B
332	3300pF(3.3 nF / 0.0033 uF)	N	N	N	N	S	S	S	S	B	B	B	B
392	3900pF(3.9 nF / 0.0039 uF)	N	N	N	N	S	S	S	S	B	B	B	B
472	4700pF(4.7 nF / 0.0047 uF)	N	N	N	N	S	S	S	S	B	B	B	B
562	5600pF(5.6 nF / 0.0056 uF)	N	N	N	N	S	S	S	S	B	B	B	B
682	6800pF(6.8 nF / 0.0068 uF)	N	N	N	N	S	S	S	S	B	B	B	B
822	8200pF(8.2 nF / 0.0082 uF)	N	N	N	N	S	S	S	S	B	B	B	B
103	10 nF (0.01 uF)	N	N	N	N	S	S	S	S	B	B	B	B
123	12 nF (0.012 uF)	N	N	N		S	S	S	S	B	B	B	B
153	15 nF (0.015 uF)	N	N	N		S	S	S	S	B	B	B	B
183	18 nF (0.018 uF)	N	N	N		S	S	S	S	B	B	B	B
223	22 nF (0.022 uF)	N	N	N	N	S	S	S	S	B	B	B	B
273	27 nF (0.027 uF)	N	N	N		S	S	S	S	B	B	B	B
333	33 nF (0.033 uF)	N	N	N	N	S	S	S	X	B	B	B	B
393	39 nF (0.039 uF)	N	N	N		S	S	S	X	B	B	B	B
473	47 nF (0.047 uF)	N	N	N	N	S	S	S	X	B	B	B	B
563	56 nF (0.056 uF)	N	N			S	S	S	X	B	B	B	B
683	68 nF (0.068 uF)	N	N		N	S	S	S	X	B	B	B	B
823	82 nF (0.082 uF)	N	N			S	S	S	X	B	B	B	B
104	100 nF (0.1 uF)	N	N	N	N	S	S	S	X	B	B	B	B
124	120 nF (0.12 uF)					S	S	X		B	B	B	D
154	150 nF (0.15 uF)					S	S	X		D	D	D	D
184	180 nF (0.18 uF)					S	S	X		D	D	D	D
224	220 nF (0.22 uF)	N	N	N		S	S	X	X	D	D	D	D
274	270 nF (0.27 uF)					X	X	X		D	D	D	I
334	330 nF (0.33 uF)					X	X	X		D	D	D	I
394	390 nF (0.39 uF)					X	X	X		D	D	D	I
474	470 nF (0.47 uF)	N				X	X	X	X	D	D	D	I



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564	560 nF (0.56 uF)					X	X			D	D	D	
684	680 nF (0.68 uF)					X	X			D	D	D	
824	820 nF (0.82 uF)					X	X			D	D	D	
105	1.0 uF					X	X	X	X	D	D	D	I
155	1.5uF									I	I	I	
225	2.2 uF					X	X			I	I	I	I
335	3.3 uF												
475	4.7 uF									I	I	I	
685	6.8 uF												
106	10 uF									I	I		



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CAP CODE	SIZE VDCW	1206					1210				1812			
		6.3	10	16	25	50	10	16	25	50	10	16	25	50
151	150pF		B	B	B	B								
181	180pF		B	B	B	B								
221	220pF		B	B	B	B								
271	270pF		B	B	B	B								
331	330pF		B	B	B	B								
391	390pF		B	B	B	B								
471	470pF		B	B	B	B								
561	560pF		B	B	B	B								
681	680pF		B	B	B	B								
821	821pF		B	B	B	B								
102	1000pF (1 nF / 0.001 uF)		B	B	B	B	C	C	C	C	D	D	D	D
122	1200pF(1.2 nF / 0.0012 uF)		B	B	B	B	C	C	C	C	D	D	D	D
152	1500pF(1.5 nF / 0.0015 uF)		B	B	B	B	C	C	C	C	D	D	D	D
182	1800pF(1.8 nF / 0.0018 uF)		B	B	B	B	C	C	C	C	D	D	D	D
222	2200pF(2.2 nF / 0.0022 uF)		B	B	B	B	C	C	C	C	D	D	D	D
272	2700pF(2.7 nF / 0.0027 uF)		B	B	B	B	C	C	C	C	D	D	D	D
332	3300pF(3.3 nF / 0.0033 uF)		B	B	B	B	C	C	C	C	D	D	D	D
392	3900pF(3.9 nF / 0.0039 uF)		B	B	B	B	C	C	C	C	D	D	D	D
472	4700pF(4.7 nF / 0.0047 uF)		B	B	B	B	C	C	C	C	D	D	D	D
562	5600pF(5.6 nF / 0.0056 uF)		B	B	B	B	C	C	C	C	D	D	D	D
682	6800pF(6.8 nF / 0.0068 uF)		B	B	B	B	C	C	C	C	D	D	D	D
822	8200pF(8.2 nF / 0.0082 uF)		B	B	B	B	C	C	C	C	D	D	D	D
103	10 nF (0.01 uF)		B	B	B	B	C	C	C	C	D	D	D	D
123	12 nF (0.012 uF)		B	B	B	B	C	C	C	C	D	D	D	D
153	15 nF (0.015 uF)		B	B	B	B	C	C	C	C	D	D	D	D
183	18 nF (0.018 uF)		B	B	B	B	C	C	C	C	D	D	D	D
223	22 nF (0.022 uF)		B	B	B	B	C	C	C	C	D	D	D	D
273	27 nF (0.027 uF)		B	B	B	B	C	C	C	C	D	D	D	D
333	33 nF (0.033 uF)		B	B	B	B	C	C	C	C	D	D	D	D
393	39 nF (0.039 uF)		B	B	B	B	C	C	C	C	D	D	D	D
473	47 nF (0.047 uF)		B	B	B	B	C	C	C	C	D	D	D	D
563	56 nF (0.056 uF)		B	B	B	B	C	C	C	C	D	D	D	D
683	68 nF (0.068 uF)		B	B	B	B	C	C	C	C	D	D	D	D
823	82 nF (0.082 uF)		B	B	B	B	C	C	C	C	D	D	D	D
104	100 nF (0.1 uF)		B	B	B	B	C	C	C	C	D	D	D	D
124	120 nF (0.12 uF)		B	B	B	B	C	C	C	C	D	D	D	D
154	150 nF (0.15 uF)		C	C	C	C	C	C	C	C	D	D	D	D
184	180 nF (0.18 uF)		C	C	C	C	C	C	C	C	D	D	D	D
224	220 nF (0.22 uF)		C	C	C	C	C	C	C	C	D	D	D	D
274	270 nF (0.27 uF)		C	C	C	D	C	C	C	C	D	D	D	D
334	330 nF (0.33 uF)		C	C	C	D	C	C	C	D	D	D	D	D
394	390 nF (0.39 uF)		C	C	J	P	C	C	C	D	D	D	D	D
474	470 nF (0.47 uF)		J	J	J	P	C	C	C	D	D	D	D	D
564	560 nF (0.56 uF)		J	J	J	P	D	D	D	D	D	D	D	D
684	680 nF (0.68 uF)		J	J	J	P	D	D	D	D	D	D	D	K



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824	820 nF (0.82 uF)		J	J	J	P	D	D	D	D	D	D	D	K
105	1.0 uF		J	J	J	P	D	D	D	D	D	D	D	K
155	1.5 uF	J	J	J	P			K	G	M				
225	2.2 uF	J	J	J	P	P		K	G	M				M
335	3.3 uF		P	P	P			K	G					
475	4.7 uF	P	P	P	P	P	K	K	K	M				
685	6.8 uF													
106	10 uF	P	P	P	P		K	K	K	M				
226	22 uF	P	P	P			M	M	M					
476	47 uF						M							



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CAP CODE	SIZE VDCW	0603	0805					1206						
		100	100	200	250	500	630	100	200	250	500	630	1000	2000
101	100pF	S	B	B	B	B	B		D	D	D	D	D	D
121	120pF	S	B	B	B	B	B		D	D	D	D	D	D
151	150pF	S	B	B	B	B	B	B	D	D	D	D	D	D
181	180pF	S	B	B	B	B	B	B	D	D	D	D	D	D
221	220pF	S	B	B	B	B	B	B	D	D	D	D	D	D
271	270pF	S	B	B	B	B	B	B	D	D	D	D	D	D
331	330pF	S	B	B	B	B	B	B	D	D	D	D	D	D
391	390pF	S	B	B	B	B	B	B	D	D	D	D	D	D
471	470pF	S	B	B	B	B	B	B	D	D	D	D	D	D
561	560pF	S	B	B	B	B	B	B	D	D	D	D	D	D
681	680pF	S	B	B	B	B	B	B	D	D	D	D	D	D
821	821pF	S	B	B	B	B	B	B	D	D	D	D	D	G
102	1000pF (1 nF / 0.001 uF)	S	B	B	B	B	B	B	D	D	D	D	D	G
122	1200pF(1.2 nF / 0.0012 uF)	S	B	B	B	B	B	B	D	D	D	D	D	G
152	1500pF(1.5 nF / 0.0015 uF)	S	B	B	B	B	B	B	D	D	D	D	D	G
182	1800pF(1.8 nF / 0.0018 uF)	S	B	B	B	B	B	B	D	D	D	D	D	G
222	2200pF(2.2 nF / 0.0022 uF)	S	B	B	B	B	B	B	D	D	D	D	D	G
272	2700pF(2.7 nF / 0.0027 uF)	S	B	B	B	B	B	B	D	D	D	D	D	G
332	3300pF(3.3 nF / 0.0033 uF)	S	B	B	B	B	B	B	D	D	D	D	D	G
392	3900pF(3.9 nF / 0.0039 uF)	S	B	B	B	B	B	B	D	D	D	D	D	
472	4700pF(4.7 nF / 0.0047 uF)	S	B	B	B	D	D	B	D	D	D	D	D	
562	5600pF(5.6 nF / 0.0056 uF)	S	B	D	D	D	D	B	D	D	D	D	D	
682	6800pF(6.8 nF / 0.0068 uF)	S	B	D	D	D	D	B	D	D	D	D	D	
822	8200pF(8.2 nF / 0.0082 uF)	S	B	D	D	D	D	B	D	D	D	D	D	
103	10 nF (0.01 uF)	S	B	D	D	D	D	B	D	D	D	D	D	
123	12 nF (0.012 uF)	X	B	D	D	D	D	B	D	D	D	D	D	G
153	15 nF (0.015 uF)	X	B	D	D	D	D	B	D	D	D	D	D	G
183	18 nF (0.018 uF)	X	B	D	D	D	D	B	D	D	D	D	D	
223	22 nF (0.022 uF)	X	B	D	D	D	D	B	D	D	G	G		
273	27 nF (0.027 uF)	X	D	D	D			B	D	D	G	G		
333	33 nF (0.033 uF)	X	D	D	D			B	G	G	G	G		
393	39 nF (0.039 uF)	X	D	D	D			B	G	G	G	G		
473	47 nF (0.047 uF)	X	D	D	D			B	G	G	G	G		
563	56 nF (0.056 uF)	X	D	D	D			B	G	G	G	G		
683	68 nF (0.068 uF)	X	D	D	D			B	G	G				
823	82 nF (0.082 uF)	X	D	D				D	G	G				
104	100 nF (0.1 uF)	X	D	D				D	G	G				
124	120 nF (0.12 uF)							D						
154	150 nF (0.15 uF)							G						
184	180 nF (0.18 uF)							G						
224	220 nF (0.22 uF)		T					G						
274	270 nF (0.27 uF)							G						
334	330 nF (0.33 uF)							G						
394	390 nF (0.39 uF)							G						
474	470 nF (0.47 uF)		I					G						



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564	560 nF (0.56 uF)							P						
684	680 nF (0.68 uF)							P						
824	820 nF (0.82 uF)							P						
105	1uF							P						
225	2.2uF							P						



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CAP CODE	SIZE VDCW	1210						1808			1812							
		100	200	250	500	630	1000	1000	2000	3000	100	200	250	500	630	1000	2000	3000
101	100pF		D	D	D	D	D											
121	120pF		D	D	D	D	D											
151	150pF		D	D	D	D	D	D	D	D								
181	180pF		D	D	D	D	D	D	D	D								
221	220pF		D	D	D	D	D	D	D	D								
271	270pF		D	D	D	D	D	D	D	D						D	D	K
331	330pF		D	D	D	D	D	D	D	K						D	D	K
391	390pF		D	D	D	D	D	D	D	K						D	D	K
471	470pF		D	D	D	D	D	D	D	K						D	D	K
561	560pF		D	D	D	D	D	D	D	K						D	D	K
681	680pF		C	C	D	D	D	D	D	K						D	D	K
821	821pF		C	C	D	D	D	D	D	K						D	D	K
102	1000pF (1 nF / 0.001 uF)	C	C	C	D	D	D	D	K	K	D	D	D	D	D	D	D	K
122	1200pF(1.2 nF / 0.0012 uF)	C	C	C	D	D	D	D	K	K	D	D	D	D	D	D	D	K
152	1500pF(1.5 nF / 0.0015 uF)	C	C	C	D	D	D	D	K	K	D	D	D	D	D	D	D	K
182	1800pF(1.8 nF / 0.0018 uF)	C	C	C	D	D	D	D	K	K	D	D	D	D	D	D	G	M
222	2200pF(2.2 nF / 0.0022 uF)	C	C	C	D	D	D	D	K		D	D	D	D	D	D	G	M
272	2700pF(2.7 nF / 0.0027 uF)	C	C	C	D	D	D	D	K		D	D	D	D	D	D	G	M
332	3300pF(3.3 nF / 0.0033 uF)	C	C	C	D	D	D	D	K		D	D	D	D	D	D	K	M
392	3900pF(3.9 nF / 0.0039 uF)	C	C	C	D	D	G	D	K		D	D	D	D	D	D	K	
472	4700pF(4.7 nF / 0.0047 uF)	C	C	C	D	D	G	D	K		D	D	D	D	D	D	K	
562	5600pF(5.6 nF / 0.0056 uF)	C	C	C	D	D	G	K	K		D	D	D	D	D	D	M	
682	6800pF(6.8 nF / 0.0068 uF)	C	C	C	D	D	G	K			D	D	D	D	D	D	M	
822	8200pF(8.2 nF / 0.0082 uF)	C	C	C	D	D	G	K			D	D	D	D	D	D	M	
103	10 nF (0.01 uF)	C	C	C	D	D	G	K			D	D	D	D	D	D	M	
123	12 nF (0.012 uF)	C	C	C	D	D	G	K			D	D	D	D	D	K		
153	15 nF (0.015 uF)	C	C	C	D	D	G	K			D	D	D	D	D	K		
183	18 nF (0.018 uF)	C	C	C	D	D	G	K			D	D	D	D	D	M		
223	22 nF (0.022 uF)	C	C	C	D	D	G	K			D	D	D	D	D	M		
273	27 nF (0.027 uF)	C	C	C	G	G					D	D	D	D	D			
333	33 nF (0.033 uF)	C	C	C	G	G		K			D	D	D	D	D	M		
393	39 nF (0.039 uF)	C	C	C	G	G					D	D	D	D	D			
473	47 nF (0.047 uF)	C	D	D	G	G		K			D	D	D	D	D	M		
563	56 nF (0.056 uF)	C	D	D	G	G					D	D	D	K	K			
683	68 nF (0.068 uF)	C	G	G	K	K					D	D	D	K	K			
823	82 nF (0.082 uF)	C	G	G	K	K					D	D	D	K	K			
104	100 nF (0.1 uF)	C	G	G	K	K					D	D	D	K	K	M		
124	120 nF (0.12 uF)	C	G	G							D	D	D	M	M			
154	150 nF (0.15 uF)	D	M	M							D	K	K	M	M			
184	180 nF (0.18 uF)	D	M	M							D	K	K	M	M			
224	220 nF (0.22 uF)	D	M	M							D	K	K	M	M			
274	270 nF (0.27 uF)	G	M	M							D	K	K					
334	330 nF (0.33 uF)	G	M	M							D	K	K					
394	390 nF (0.39 uF)	M	M	M							D	K	K					
474	470 nF (0.47 uF)	M	M	M							K	K	K					



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564	560 nF (0.56 uF)	M									K	M	M					
684	680 nF (0.68 uF)	K									K	M	M					
824	820 nF (0.82 uF)	K									K	M	M					
105	1.0uF	K									K	M	M					
155	1.5uF	M									K							
225	2.2uF	M									M							



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X7R (Hi-voltage)

CAP CODE	SIZE VDCW	2220												
		1000	2000	3000										
101	100pF													
151	150pF													
181	180pF													
221	220pF													
271	270pF													
331	330pF													
391	390pF													
471	470pF													
561	560pF													
681	680pF													
821	821pF													
102	1000pF (1 nF / 0.001 uF)	V	V	V										
122	1200pF(1.2 nF / 0.0012 uF)	V	V	V										
152	1500pF(1.5 nF / 0.0015 uF)	V	V	V										
182	1800pF(1.8 nF / 0.0018 uF)	V	V	V										
222	2200pF(2.2 nF / 0.0022 uF)	V	V	V										
272	2700pF(2.7 nF / 0.0027 uF)	V	V	V										
332	3300pF(3.3 nF / 0.0033 uF)	V	V	V										
392	3900pF(3.9 nF / 0.0039 uF)	V	V	V										
472	4700pF(4.7 nF / 0.0047 uF)	V	V											
562	5600pF(5.6 nF / 0.0056 uF)	V	V											
682	6800pF(6.8 nF / 0.0068 uF)	V	V											
822	8200pF(8.2 nF / 0.0082 uF)	V	V											
103	10 nF (0.01 uF)	V	V											
123	12 nF (0.012 uF)	V												
153	15 nF (0.015 uF)	V												
183	18 nF (0.018 uF)	V												
223	22 nF (0.022 uF)	V												
273	27 nF (0.027 uF)	V												
333	33 nF (0.033 uF)	V												
393	39 nF (0.039 uF)	V												
473	47 nF (0.047 uF)	V												
563	56 nF (0.056 uF)													
683	68 nF (0.068 uF)													
823	82 nF (0.082 uF)													
104	100 nF (0.1 uF)													
124	120 nF (0.12 uF)													
154	150 nF (0.15 uF)													
184	180 nF (0.18 uF)													
224	220 nF (0.22 uF)													



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274	270 nF (0.27 uF)																		
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X5R

CAP CODE	SIZE VDCW	0201																		
		6.3	10	16	25	50														
101	100pF			L	L	L														
121	120pF			L	L	L														
151	150pF			L	L	L														
181	180pF			L	L	L														
221	220pF			L	L	L														
271	270pF			L	L	L														
331	330pF			L	L	L														
391	390pF			L	L	L														
471	470pF			L	L	L														
561	560pF			L	L	L														
681	680pF			L	L	L														
821	821pF			L	L	L														
102	1000pF (1 nF / 0.001 uF)		L	L	L	L														
152	1500pF(1.5 nF / 0.0015 uF)		L	L																
222	2200pF(2.2 nF / 0.0022 uF)		L	L																
272	2700pF(2.7 nF / 0.0027 uF)		L	L																
332	3300pF(3.3 nF / 0.0033 uF)		L	L																
472	4700pF(4.7 nF / 0.0047 uF)		L	L																
682	6800pF(6.8 nF / 0.0068 uF)		L																	
103	10 nF (0.01 uF)	L	L	L	L															
153	15 nF (0.015 uF)	L	L																	
223	22 nF (0.022 uF)	L	L																	
273	27 nF (0.027 uF)	L	L																	
333	33 nF (0.033 uF)	L	L																	
393	39 nF (0.039 uF)	L	L																	
473	47 nF (0.047 uF)	L	L																	
563	56 nF (0.056 uF)	L	L																	
683	68 nF (0.068 uF)	L	L																	
823	82 nF (0.082 uF)	L	L																	
104	100 nF (0.1 uF)	L	L	L	L															
224	220 nF (0.22 uF)	L	L																	
474	470 nF (0.47 uF)	L																		
105	1 uF	L	L																	
225	10 uF	L																		



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X5R

CAP CODE	SIZE VDCW	0402					0603					0805				
		6.3	10	16	25	50	6.3	10	16	25	50	6.3	10	16	25	50
273	27 nF (0.027 uF)			N												
333	33 nF (0.033 uF)			N												
393	39 nF (0.039 uF)			N												
473	47 nF (0.047 uF)			N												
563	56 nF (0.056 uF)		N	N												
683	68 nF (0.068 uF)		N	N												
823	82 nF (0.082 uF)	N	N	N												
104	100 nF (0.1 uF)	N	N	N	N	N										
154	150 nF (0.15 uF)	N	N	N	N											
224	220 nF (0.22 uF)	N	N	N	N	N			X	X						
274	270 nF (0.27 uF)							X	X	X						
334	330 nF (0.33 uF)	N	N				X	X	X	X						
394	390 nF (0.39 uF)							X	X	X						
474	470 nF (0.47 uF)	N	N	E	E	E	X	X	X	X	X					
684	680 nF (0.68 uF)	N	N				X	X	X	X						
824	820 nF (0.82 uF)						X	X	X							
105	1.0uF	N	N	N	N		X	X	X	X	X		D	D	D	I
155	1.5uF						X					I	I	I	I	
225	2.2uF	N	N	E	E		X	X	X	X	X	I	I	I	I	I
335	3.3uF						X	X				I	I	I	I	
475	4.7uF	E	E	E			X	X	X	X		I	I	I	I	I
685	6.8uF															
106	10 uF	E	E				X	X	X	X		I	I	I	I	I
226	22 uF						X	X				I	I	I	I	
476	47 uF						X					I	I			
107	100 uF															



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X5R

CAP CODE	SIZE VDCW	1206					1210					1812
		6.3	10	16	25	50	6.3	10	16	25	50	6.3
273	27 nF (0.027 uF)											
333	33 nF (0.033 uF)											
393	39 nF (0.039 uF)											
473	47 nF (0.047 uF)											
563	56 nF (0.056 uF)											
683	68 nF (0.068 uF)											
823	82 nF (0.082 uF)											
104	100 nF (0.1 uF)											
154	150 nF (0.15 uF)											
224	220 nF (0.22 uF)											
274	270 nF (0.27 uF)											
334	330 nF (0.33 uF)											
394	390 nF (0.39 uF)											
474	470 nF (0.47 uF)											
684	680 nF (0.68 uF)											
824	820 nF (0.82 uF)											
105	1.0uF											
155	1.5uF		J	J				K	K			
225	2.2uF		J	J	P	P		K	K			
335	3.3uF		P	P	P							
475	4.7uF	P	P	P	P	P		K	K	K		
685	6.8uF	P	P									
106	10 uF	P	P	P	P	P	K	K	K	K	M	
226	22 uF	P	P	P	P		M	M	M	M		
476	47 uF	P	P				M	M	M			
107	100 uF	P					M	M				U



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Y5V

CAP CODE	SIZE VDCW	0402					0603					0805				
		6.3	10	16	25	50	6.3	10	16	25	50	6.3	10	16	25	50
103	10 nF (0.01 uF)		N	N	N	N		S	S	S	S		A	A	A	A
123	12 nF (0.012 uF)		N	N	N	N		S	S	S	S		A	A	A	A
153	15 nF (0.015 uF)		N	N	N	N		S	S	S	S		A	A	A	A
183	18 nF (0.018 uF)		N	N	N	N		S	S	S	S		A	A	A	A
223	22 nF (0.022 uF)		N	N	N	N		S	S	S	S		A	A	A	A
273	27 nF (0.027 uF)		N	N	N	N		S	S	S	S		A	A	A	A
333	33 nF (0.033 uF)		N	N	N	N		S	S	S	S		A	A	A	A
393	39 nF (0.039 uF)		N	N	N			S	S	S	S		A	A	A	A
473	47 nF (0.047 uF)		N	N	N			S	S	S	S		A	A	A	A
563	56 nF (0.056 uF)		N	N	N			S	S	S	S		A	A	A	A
683	68 nF (0.068 uF)		N	N	N			S	S	S	S		A	A	A	A
823	82 nF (0.082 uF)		N	N	N			S	S	S	S		A	A	A	A
104	100 nF (0.1 uF)		N	N	N			S	S	S	S		A	A	A	A
124	120 nF (0.12 uF)		N					S	S	S	S		A	A	A	A
154	150 nF (0.15 uF)		N	N				S	S	S	S		A	A	A	A
224	220 nF (0.22 uF)	N	N	N			S	S	S	S	S		A	A	A	A
334	330 nF (0.33 uF)	N	N	N				S	S	S	X		B	B	B	B
474	470 nF (0.47 uF)	N	N	N				S	S	X	X		B	B	B	B
684	680 nF (0.68 uF)	N						S	X	X			B	B	D	D
105	1 uF	N	N					S	X	X			B	B	D	D
155	1.5 uF							S					D	D		
225	2.2 uF						S	S	X				D	D	I	
335	3.3 uF												D	D		
475	4.7 uF						X	X					D	D	I	
685	6.8 uF												I			
106	10 uF											I	I	I		
226	22 uF											I	I			



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Y5V

CAP CODE	SIZE VDCW	1206						1210						1812			
		6.3	10	16	25	35	50	6.3	10	16	25	35	50	10	16	25	50
103	10 nF (0.01 uF)		B	B	B		B										
123	12 nF (0.012 uF)		B	B	B		B										
153	15 nF (0.015 uF)		B	B	B		B										
183	18 nF (0.018 uF)		B	B	B		B										
223	22 nF (0.022 uF)		B	B	B		B										
273	27 nF (0.027 uF)		B	B	B		B										
333	33 nF (0.033 uF)		B	B	B		B										
393	39 nF (0.039 uF)		B	B	B		B										
473	47 nF (0.047 uF)		B	B	B		B										
563	56 nF (0.056 uF)		B	B	B		B										
683	68 nF (0.068 uF)		B	B	B		B										
823	82 nF (0.082 uF)		B	B	B		B										
104	100 nF (0.1 uF)		B	B	B		B		C	C	C		C	D	D	D	D
124	120 nF (0.12 uF)		B	B	B		B		C	C	C		C	D	D	D	D
154	150 nF (0.15 uF)		B	B	B		B		C	C	C		C	D	D	D	D
224	220 nF (0.22 uF)		B	B	B		B		C	C	C		C	D	D	D	D
334	330 nF (0.33 uF)		B	B	B		B		C	C	C		C	D	D	D	D
474	470 nF (0.47 uF)		B	B	B		B		C	C	C		C	D	D	D	D
684	680 nF (0.68 uF)		B	B	B		B		C	C	C		C	D	D	D	D
105	1 uF		C	C	C		C		C	C	C		C	D	D	D	D
155	1.5 uF		C	C	C				C	C	C			D	D	D	D
225	2.2 uF		C	C	C		J		C	C	C		G	D	D	D	D
335	3.3 uF		J	J	J				C	C	C			D	D	D	D
475	4.7 uF		J	J	J	J	P		C	C	D		G	D	D	D	D
685	6.8 uF		J	J					C	C	D		K	D	D	D	D
106	10 uF		J	J	P				D	D	G	K	K	D	D	D	K
226	22 uF		P	P						K	K						
476	47uF	P							K	K					M		
107	100uF								M								



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Y5V (Hi-voltage)

CAP CODE	SIZE VDCW	0805			1206			1210			1812		
		100	200	250	100	200	250	100	200	250	100	200	250
103	10 nF (0.01 uF)	B	B	B	B	B	B	C	C	C	D	D	D
153	15 nF (0.015 uF)	B	B	B	B	B	B	C	C	C	D	D	D
223	22 nF (0.022 uF)	B	B	B	B	B	B	C	C	C	D	D	D
333	33 nF (0.033 uF)	B	B	B	B	B	B	C	C	C	D	D	D
473	47 nF (0.047 uF)	B	B	B	B	B	B	C	C	C	D	D	D
683	68 nF (0.068 uF)	B	B	B	B	B	B	C	C	C	D	D	D
104	100 nF (0.1 uF)	B			B	B	B	C	C	C	D	D	D
154	150 nF (0.15 uF)				C	C	C	C	C	C	D	D	D
224	220 nF (0.22 uF)				C			C			D	D	D
334	330 nF (0.33 uF)							C			D	D	D
474	470 nF (0.47 uF)										D	D	D
684	680 nF (0.68 uF)										D	D	D
105	1 uF										D		

● Chip Thickness :

$$N = 0.50 \pm 0.05$$

$$S = 0.80 \pm 0.07$$

$$X = 0.80 + 0.15/-0.10$$

$$A = 0.60 \pm 0.10$$

$$B = 0.80 \pm 0.10$$

$$D = 1.25 \pm 0.10$$

$$I = 1.25 \pm 0.20$$

$$C = 0.95 \pm 0.10$$

$$J = 1.15 \pm 0.15$$

$$P = 1.60+0.30/-0.10$$

$$K = 2.00 \pm 0.20$$

$$M = 2.50 \pm 0.30$$

$$U = 2.80 \pm 0.30$$

$$V = 2.00 \pm 0.20 \text{ or } 2.50 \pm 0.50$$

$$L = 0.30 \pm 0.03$$

$$T = 0.85 \pm 0.10$$

$$G = 1.6 \pm 0.20$$