X7R - COMMERCIAL - 16Vdc to 10KVdc

Stable EIA Class II dielectric, with +/-15% temperature coefficient and predictable variation of electrical properties with time, temperature and voltage. These chips are designed for surface mount application with nickel barrier terminations suitable for solder wave, vapor phase or reflow solder board attachment. Also available in silver-palladium terminations for hybrid use with conductive epoxy. Class II X7R chips are used as decoupling, by-pass, filtering and transient voltage suppression elements.

CAPACITANCE & VOLTAGE SELECTION FOR POPULAR CHIP SIZES

3 digit code: two significant digits, followed by number of zeros eg: 183 = 18,000 pF. R denotes decimal, eg. 2R7 = 2.7 pF

MAX CAP & VOLTAGE

SIZE	0402	0504	0603	0805	1005	1206	1210	1515	1808		1812		1825	
Min Cap	121	121	121	121	121	121	121	151	151	151	151	151	471	471
Tmax	.024	.044	.035	.054	.054	.064	.065	.130	.065	.080[X]	.065	.100[X]	.080	.140[X]
16V	562	393	273	124	154	334	474	125	684	824	125	155	185	225
25V	472	333	223	104	124	274	474	105	564	564	105	125	155	225
50V	472	333	223	104	124	274	474	824	394	564	824	125	155	225
100V	472	333	223	683	823	184	334	684	274	394	564	824	125	185
200V	222	153	103	333	473	104	184	564	184	224	334	564	824	155
250V	152	103	682	273	393	683	124	394	124	154	224	394	684	125
300V	•	•	•	153	183	473	823	274	823	104	154	224	474	824
400V	•	•	•	123	123	273	563	224	563	823	104	184	334	564
500V	•	•	•	123	822	223	563	154	563	683	104	154	334	474
600V	•	•	•	822	822	183	393	124	393	563	683	124	224	394
800V*	•	•	•	472	472	103	273	823	273	333	473	683	124	274
1000V*	•	•	•	272	272	682	153	563	153	223	273	473	823	154
1500V*	•	•	•	•	•	222	472	183	472	682	822	153	273	563
2000V*	•	•	•	•	•	102	222	822	272	332	472	682	123	273
3000V*	•	•	•	•	•	•	•	332	821	122	152	272	472	103
4000V*	•	•	•	•	•	•	•	122	331	391	681	122	152	272
5000V*	•	•	•	•	•	•	•	•	•	•	•	•	821	182
6000V*	•	•	•	•	•	•	•	•	•					
7000V*	•	•	•	•	•	•	•	•	•					
8000V*	•	•	•	•	•	•	•	•	•					
9000V*	•	•	•	•	•	•	•	•	•					
10000V*	•	•	•	•	•	•	•	•	•	•	•	•	•	•

Note: " X " denotes a special thickness (see Tmax row above). An X is required in the part number. Please refer to page 10 for how to order.

* Units rated above 800V may require conformal coating in use to preclude arcing over the chip surface

NOTE: REFER TO PAGES 10 & 11 FOR ORDERING INFORMATION

See chart for standard EIA case sizes and available capacitance and voltage ratings. Special sizes, thicknesses and other voltage ratings are available, see other NOVACAP product offerings. High reliability testing is available refer to pages 22-23. Please consult the factory with your requirements. NOVACAP has complete testing facilities at your disposal.

CAPACITANCE & VOLTAGE SELECTION FOR POPULAR CHIP SIZES

3 digit code: two significant digits, followed by number of zeros eg: 183 = 18,000 pF. R denotes decimal, eg. 2R7 = 2.7 pF

MAX CAP & VOLTAGE

SIZE	2020	2221	2225		2520	3333	3530	4040	4540	5440	5550	6560	7565
Min Cap	102	471	471	471	102	102	102	102	102	102	102	222	222
Tmax	.180	.080	.080	.150[X]	.180	.250	.250	.300	.300	.300	.300	.300	.300
16V	185	155	225	275						•	•	•	•
25V	155	125	185	225						•	•	•	•
50V	155	125	185	225						•	•	•	•
100V	155	125	155	225	•					•	•	•	•
200V	125	684	105	185	•	•	•	•	•	•	•	•	•
250V	105	564	824	155	•	•	•	•	•	•	•	•	•
300V	824	394	474	105	•	•	•	•	•	•	•	•	•
400V	564	274	394	684	•	•	•	•	•	•	•	•	•
500V	474	274	334	564	684	105	105	185	185	185	225	335	475
600V	274	224	274	474	394	684	684	155	155	155	225	275	395
800V*	224	124	154	334	274	474	394	684	824	105	155	225	275
1000V*	154	823	104	224	184	334	334	564	684	684	105	155	225
1500V*	473	273	333	683	563	124	124	274	334	334	474	684	824
2000V*	273	123	153	333	273	823	683	154	184	184	274	394	474
3000V*	103	472	562	123	123	333	273	683	683	823	124	184	224
4000V*	272	152	152	332	472	183	153	223	333	393	473	823	104
5000V*	152	821	102	222	272	123	103	123	183	223	333	473	563
6000V*	•	•	•	•	•	682	562	822	123	153	223	333	393
7000V*	•	•	•	•	•	•	472	562	822	103	153	223	273
8000V*	•	•	•	•	•	•	332	472	682	822	123	153	223
9000V*	•	•	•	•	•	•	272	332	472	562	103	123	183
10000V*	•	•	•	•	•	•	182	272	392	472	682	103	123

Note: " X " denotes a special thickness (see Tmax row above). An X is required in the part number. Please refer to page 10 for how to order.

* Units rated above 800V may require conformal coating in use to preclude arcing over the chip surface

NOTE: REFER TO PAGES 10 & 11 FOR ORDERING INFORMATION

STANDARD SMT CHIP P/N BREAKDOWN

1206 N 472 J 101 N X050 H T M

Case Size

Dielectric Code

Code	EIA	Class
N	COG/NP0	Ultra Stable
B	X7R	Stable
X	BX	MIL
Y	Y5V	General Purpose
Z	Z5U	General Purpose
S	X8R	High Temp up to 150ºC
D	COG/NPO	High Temp up to 200°C
E	Class II (Stable)	High Temp up to 200°C

Capacitance

1st two digits are significant, third digit denotes number of zeros, R= decimal
Examples:
1R0 = 1.0 pF
120 = 12 pF
471 = 470 pF
102 = 1,000 pF
273 = .027 µF
474 = 0.47 µF
105 = 1.0 µF

Capacitance Tolerance

Code		COG NPO	X7R	BX	Z5U Y5V	X8R 150°C	D 200°C	E 200°C
Cap Value < 10pF B	±0.10pF							
C	±0.25pF							
D	±0.50pF							
F	± 1%pF							
G	± 2%pF							
J	± 5%pF							
K	±10%pF							
M	±20%pF							
Z	+80% -20%							
P	+100%/-0%							

Marking

M = Marked
None = Unmarked
Marking not available on sizes 0603 and below

Packaging

T= Tape and Reel
W = Waffle Pack
None = Bulk

High Reliability Testing

H = High Reliablity Testing Required
None = Standard SMT, no High-Rel
Consult catalog to determine MIL SPEC required.

Special Thickness

X in the part number denotes a special thickness other than standard. Specify in mils if required. (As shown above X=.050")
If no **X** in the part number then thickness is standard per Novacap catalog specifications.

Termination

N = Nickel Barrier (100% Tin)
P = Palladium Silver
Y= Nickel Barrier (90%Tin/10%Lead)
S= Silver
C = Polymer with Nickel Barrier (100% Tin)
D = Polymer with Nickel Barrier (90%Tin/10%Lead)
V = Non-Solderable Silver

Voltage

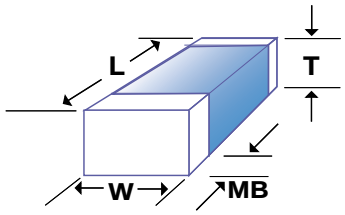
Examples:

160 = 16 Volts	202 = 2000 Volts
250 = 25 Volts	302 = 3000 Volts
500 = 50 Volts	402 = 4000 Volts
101 = 100 Volts	502 = 5000 Volts
251 = 250 Volts	602 = 6000 Volts
501 = 500 Volts	802 = 8000 Volts
102 = 1000 Volts	103 = 10,000 Volts

This ordering information relates to NOVACAP's standard surface mount capacitors. Please refer to the specific catalog pages for ordering information for our application specific products; ie: Stacked, Leaded, Capacitor Arrays, Pulsed Power capacitors and other specialty products.

PART NUMBER PREFIX DEFINITIONS

LS = Y3 Certified Safety Capacitor	pg. 36
ES = Y2 Certified Safety Capacitor	pg. 37
AP = Arc Prevention Capacitor	pg. 50
CR = Cap-Rack Capacitor Array	pg. 40 - 41
RD = Ring Detect Capacitor	pg. 38
ST = Stacked Capacitor Assembly	pg. 48 - 49
SM = Hi-Rel Stacked Capacitor Assembly	pg. 48 - 49



CODE COMBINATIONS

Dielectric Code	Max. Temp. Rated	Terminations (allowed)
N (COG/NPO)	125º	N, P, Y, S, V
B (X7R)	125º	N, P, Y, C, D, S, V
X (BX)	125º	N, P, Y, C, D, S, V
Y (Y5V)	125º	N, Y, C, D
Z (Z5U)	125º	N, Y, C, D
D (NPO-HIGH TEMP)	200º	P, S, V
E (CLASS 11-HIGH TEMP)	200º	P, S, V
F (NPO-HIGH TEMP)	160º	N, P, Y, S, V
G (CLASS 11-HIGH TEMP)	160º	N, P, Y, S, V
S (X8R)	150º	N, P, Y, S, V
P (PULSE POWER)	125º	P
R (R2D)	200º	P

DIMENSIONS INCHES (MM)

SIZE	0402	0504	0603	0805	0907	1005	1206	1210	1515	1808	1812	1825
LENGTH L	.040 (1.02)	.050 (1.27)	.060 (1.52)	.080 (2.03)	.090 (2.29)	.100 (2.54)	.125 (3.18)	.125 (3.18)	.150 (3.81)	.180 (4.57)	.180 (4.57)	.180 (4.57)
WIDTH W	.020 (.508)	.040 (1.02)	.030 (.762)	.050 (1.27)	.070 (1.78)	.050 (1.27)	.060 (1.52)	.100 (2.54)	.150 (3.81)	.080 (2.03)	.125 (3.18)	.250 (6.35)
T MAX.	.024 (.610)	.044 (1.12)	.035 (.889)	.054 (1.37)	.054 (1.37)	.054 (1.37)	.064 (1.63)	.065 (1.65)	.130 (3.30)	.065 (1.65)	.065 (1.65)	.080 (2.03)
MB	.010 (.254)	.014 (.356)	.014 (.356)	.020 (.508)	.020 (.508)	.020 (.508)	.020 (.508)	.020 (.508)	.040 (1.02)	.024 (.610)	.024 (.610)	.024 (.610)

TOLERANCE +/- INCHES (MM)

LENGTH	.004 (.102)	.006 (.152)	.006 (.152)	.008 (.203)	.008 (.203)	.008 (.203)	.008 (.203)	.008 (.203)	.015 (.381)	.012 (.305)	.012 (.305)	.012 (.305)
WIDTH	.004 (.102)	.006 (.152)	.006 (.152)	.008 (.203)	.008 (.203)	.008 (.203)	.008 (.203)	.008 (.203)	.015 (.381)	.008 (.203)	.008 (.203)	.015 (.381)
MB	.006 (.152)	.006 (.152)	.006 (.152)	.010 (.254)	.010 (.254)	.010 (.254)	.010 (.254)	.010 (.254)	.015 (.381)	.014 (.356)	.014 (.356)	.014 (.356)

DIMENSIONS INCHES (MM)

SIZE	2020	2221	2225	2520	3333	3530	4040	4540	5440	5550	6560	7565
LENGTH L	.200 (5.08)	.220 (5.59)	.220 (5.59)	.250 (6.35)	.330 (8.38)	.350 (8.89)	.400 (10.2)	.450 (11.4)	.540 (13.7)	.550 (14.0)	.650 (16.5)	.750 (19.1)
WIDTH W	.200 (5.08)	.210 (5.33)	.250 (6.35)	.200 (5.08)	.330 (8.38)	.300 (7.62)	.400 (10.2)	.400 (10.2)	.400 (10.2)	.500 (12.7)	.600 (15.2)	.650 (16.5)
T MAX.	.180 (4.57)	.080 (2.03)	.080 (2.03)	.180 (4.57)	.250 (6.35)	.250 (6.35)	.300 (7.62)	.300 (7.62)	.300 (7.62)	.300 (7.62)	.300 (7.62)	.300 (7.62)
MB	.024 (.610)	.030 (.762)	.030 (.762)	.030 (.762)	.030 (.762)	.030 (.762)	.040 (1.02)	.040 (1.02)	.040 (1.02)	.040 (1.02)	.040 (1.02)	.040 (1.02)

TOLERANCE +/- INCHES (MM)

LENGTH	.015 (.381)	.015 (.381)	.015 (.381)	.015 (.381)	.017 (.432)	.018 (.457)	.020 (.508)	.023 (.584)	.027 (.686)	.028 (.711)	.033 (.838)	.038 (.965)
WIDTH	.015 (.381)	.015 (.381)	.015 (.381)	.015 (.381)	.017 (.432)	.015 (.381)	.020 (.508)	.020 (.508)	.020 (.508)	.025 (.635)	.030 (.762)	.033 (.838)
MB	.014 (.356)	.015 (.381)	.015 (.381)	.015 (.381)	.015 (.381)	.015 (.381)	.020 (.508)	.020 (.508)	.020 (.508)	.020 (.508)	.020 (.508)	.020 (.508)

NOVACAP - 25136 Anza Drive -Valencia CA 91355
Tel: 661-295-5920 Fax: (661) 295-5928 Email: sales@novacap.com

COG - COMMERCIAL - 16Vdc to 10KVdc

Ultra stable Class I dielectric (EIA COG) or NPO: linear temperature coefficient, low loss, stable electrical properties with time, voltage and frequency. Designed for surface mount application with nickel barrier termination suitable for solder wave, vapor phase or reflow solder board attachment. Also available with silver-palladium terminations for hybrid use with conductive epoxy. COG chips are used in precision circuitry requiring Class I stability.

CAPACITANCE & VOLTAGE SELECTION FOR POPULAR CHIP SIZES

3 digit code: two significant digits, followed by number of zeros eg: 183 = 18,000 pF. R denotes decimal, eg. 2R7 = 2.7 pF

MAX CAP & VOLTAGE

SIZE	0402	0504	0603	0805	1005	1206	1210	1515	1808		1812		1825	
Min Cap	0R3	0R5	0R3	0R5	0R5	3R0	5R0	3R0	5R0	5R0	100	100	150	150
Tmax	.024	.044	.035	.054	.054	.064	.065	.130	.065	.080[X]	.065	.100[X]	.080	.140[X]
16V	271	222	152	562	822	153	273	473	393	393	563	563	104	104
25V	221	182	122	472	682	123	273	393	333	333	563	563	104	104
50V	181	152	102	392	562	123	223	333	223	273	393	393	104	104
100V	181	152	102	392	562	103	183	333	153	223	273	393	683	823
200V	101	821	561	182	272	562	103	223	103	153	183	273	473	683
250V	560	561	331	152	222	392	822	223	682	103	153	223	393	563
300V	•	•	•	821	122	272	472	153	472	562	103	153	223	473
400V	•	•	•	821	122	182	472	103	472	472	103	123	223	333
500V	•	•	•	821	122	182	472	822	472	472	103	123	223	273
600V	•	•	•	681	102	152	392	682	392	472	822	103	183	183
800V*	•	•	•	681	102	152	392	682	392	472	822	103	183	183
1000V*	•	•	•	471	391	102	222	562	222	332	472	822	103	153
1500V*	•	•	•	•	•	561	122	392	122	182	272	472	562	103
2000V*	•	•	•	•	•	391	821	272	821	122	182	272	272	562
3000V*	•	•	•	•	•	•	•	122	391	471	821	122	122	222
4000V*	•	•	•	•	•	•	•	681	221	271	471	821	681	122
5000V*	•	•	•	•	•	•	•	•	•	•	•	•	391	821
6000V*	•	•	•	•	•	•	•	•	•					
7000V*	•	•	•	•	•	•	•	•	•					
8000V*	•	•	•	•	•	•	•	•	•					
9000V*	•	•	•	•	•	•	•	•	•					
10000V*	•	•	•	•	•	•	•	•	•	•	•	•	•	•

Note: " X " denotes a special thickness (see Tmax row above). An X is required in the part number. Please refer to page 10 for how to order.

* Units rated above 800V may require conformal coating in use to preclude arcing over the chip surface

NOTE: REFER TO PAGES 10 & 11 FOR ORDERING INFORMATION

See chart for standard EIA case sizes and available capacitance and voltage ratings. Special sizes, thicknesses and other voltage ratings are available, see other NOVACAP product offerings. High reliability testing is available refer to pages 20-21. Please consult the factory with your requirements. NOVACAP has complete testing facilities at your disposal.

C A P A C I T A N C E & V O L T A G E S E L E C T I O N F O R P O P U L A R C H I P S I Z E S

3 digit code: two significant digits, followed by number of zeros eg: 183 = 18,000 pF. R denotes decimal, eg. 2R7 = 2.7 pF

M A X C A P & V O L T A G E

SIZE	2020	2221	2225		2520	3333	3530	4040	4540	5440	5550	6560	7565
Min Cap	270	270	270	270	390	390	390	390	390	390	390	560	101
Tmax	.180	.080	.080	.150[X]	.180	.250	.250	.300	.300	.300	.300	.300	.300
16V	683	104	124	124						•	•	•	•
25V	683	104	124	124						•	•	•	•
50V	683	104	124	124						•	•	•	•
100V	563	683	823	104						•	•	•	•
200V	563	473	563	823	•	•	•	•	•	•	•	•	•
250V	473	393	473	683	•	•	•	•	•	•	•	•	•
300V	393	223	273	563	•	•	•	•	•	•	•	•	•
400V	333	223	273	393	•	•	•	•	•	•	•	•	•
500V	273	223	273	333	393	473	683	104	124	154	184	274	334
600V	153	183	273	273	223	393	393	823	823	104	154	224	274
800V*	153	183	273	273	183	333	333	563	683	823	124	184	224
1000V*	103	103	153	223	123	273	273	563	563	683	104	154	184
1500V*	822	562	822	153	103	183	223	393	393	393	393	823	124
2000V*	472	272	392	822	562	153	153	273	333	333	473	683	104
3000V*	222	122	182	332	272	822	103	183	223	223	333	473	683
4000V*	122	681	102	182	152	332	562	123	123	123	183	273	393
5000V*	821	391	561	122	102	222	332	682	822	822	123	183	223
6000V*	•	•	•	•	•	182	182	392	392	472	562	103	123
7000V*	•	•	•	•	•	•	122	272	272	332	472	682	822
8000V*	•	•	•	•	•	•	102	222	222	272	332	562	682
9000V*	•	•	•	•	•	•	821	152	182	182	272	392	472
10000V*	•	•	•	•	•	•	681	122	152	152	222	332	392

Note: " X " denotes a special thickness (see Tmax row above). An X is required in the part number. Please refer to page 10 for how to order.

* Units rated above 800V may require conformal coating in use to preclude arcing over the chip surface

NOTE: REFER TO PAGES 10 & 11 FOR ORDERING INFORMATION

STANDARD SMT CHIP P/N BREAKDOWN

1206 N 472 J 101 N X050 H T M

Case Size

Dielectric Code

Code	EIA	Class
N	COG/NP0	Ultra Stable
B	X7R	Stable
X	BX	MIL
Y	Y5V	General Purpose
Z	Z5U	General Purpose
S	X8R	High Temp up to 150ºC
D	COG/NPO	High Temp up to 200°C
E	Class II (Stable)	High Temp up to 200°C

Capacitance

1st two digits are significant, third digit denotes number of zeros, R= decimal
Examples:
1R0 = 1.0 pF
120 = 12 pF
471 = 470 pF
102 = 1,000 pF
273 = .027 µF
474 = 0.47 µF
105 = 1.0 µF

Capacitance Tolerance

Code		COG NPO	X7R	BX	Z5U Y5V	X8R 150°C	D 200°C	E 200°C
Cap Value < 10pF B	±0.10pF							
C	±0.25pF							
D	±0.50pF							
F	± 1%pF							
G	± 2%pF							
J	± 5%pF							
K	±10%pF							
M	±20%pF							
Z	+80% -20%							
P	+100%/-0%							

Marking

M = Marked
None = Unmarked
Marking not available on sizes 0603 and below

Packaging

T= Tape and Reel
W = Waffle Pack
None = Bulk

High Reliability Testing

H = High Reliablity Testing Required
None = Standard SMT, no High-Rel
Consult catalog to determine MIL SPEC required.

Special Thickness

X in the part number denotes a special thickness other than standard. Specify in mils if required. (As shown above X=.050")
If no **X** in the part number then thickness is standard per Novacap catalog specifications.

Termination

N = Nickel Barrier (100% Tin)
P = Palladium Silver
Y= Nickel Barrier (90%Tin/10%Lead)
S= Silver
C = Polymer with Nickel Barrier (100% Tin)
D = Polymer with Nickel Barrier (90%Tin/10%Lead)
V = Non-Solderable Silver

Voltage

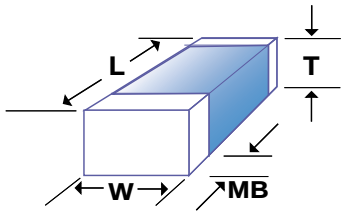
Examples:

160 = 16 Volts	202 = 2000 Volts
250 = 25 Volts	302 = 3000 Volts
500 = 50 Volts	402 = 4000 Volts
101 = 100 Volts	502 = 5000 Volts
251 = 250 Volts	602 = 6000 Volts
501 = 500 Volts	802 = 8000 Volts
102 = 1000 Volts	103 = 10,000 Volts

This ordering information relates to NOVACAP's standard surface mount capacitors. Please refer to the specific catalog pages for ordering information for our application specific products; ie: Stacked, Leaded, Capacitor Arrays, Pulsed Power capacitors and other specialty products.

PART NUMBER PREFIX DEFINITIONS

LS = Y3 Certified Safety Capacitor	pg. 36
ES = Y2 Certified Safety Capacitor	pg. 37
AP = Arc Prevention Capacitor	pg. 50
CR = Cap-Rack Capacitor Array	pg. 40 - 41
RD = Ring Detect Capacitor	pg. 38
ST = Stacked Capacitor Assembly	pg. 48 - 49
SM = Hi-Rel Stacked Capacitor Assembly	pg. 48 - 49



CODE COMBINATIONS

Dielectric Code	Max. Temp. Rated	Terminations (allowed)
N (COG/NPO)	125º	N, P, Y, S, V
B (X7R)	125º	N, P, Y, C, D, S, V
X (BX)	125º	N, P, Y, C, D, S, V
Y (Y5V)	125º	N, Y, C, D
Z (Z5U)	125º	N, Y, C, D
D (NPO-HIGH TEMP)	200º	P, S, V
E (CLASS 11-HIGH TEMP)	200º	P, S, V
F (NPO-HIGH TEMP)	160º	N, P, Y, S, V
G (CLASS 11-HIGH TEMP)	160º	N, P, Y, S, V
S (X8R)	150º	N, P, Y, S, V
P (PULSE POWER)	125º	P
R (R2D)	200º	P

DIMENSIONS INCHES (MM)

SIZE	0402	0504	0603	0805	0907	1005	1206	1210	1515	1808	1812	1825
LENGTH L	.040 (1.02)	.050 (1.27)	.060 (1.52)	.080 (2.03)	.090 (2.29)	.100 (2.54)	.125 (3.18)	.125 (3.18)	.150 (3.81)	.180 (4.57)	.180 (4.57)	.180 (4.57)
WIDTH W	.020 (.508)	.040 (1.02)	.030 (.762)	.050 (1.27)	.070 (1.78)	.050 (1.27)	.060 (1.52)	.100 (2.54)	.150 (3.81)	.080 (2.03)	.125 (3.18)	.250 (6.35)
T MAX.	.024 (.610)	.044 (1.12)	.035 (.889)	.054 (1.37)	.054 (1.37)	.054 (1.37)	.064 (1.63)	.065 (1.65)	.130 (3.30)	.065 (1.65)	.065 (1.65)	.080 (2.03)
MB	.010 (.254)	.014 (.356)	.014 (.356)	.020 (.508)	.020 (.508)	.020 (.508)	.020 (.508)	.020 (.508)	.040 (1.02)	.024 (.610)	.024 (.610)	.024 (.610)

TOLERANCE +/- INCHES (MM)

LENGTH	.004 (.102)	.006 (.152)	.006 (.152)	.008 (.203)	.008 (.203)	.008 (.203)	.008 (.203)	.008 (.203)	.015 (.381)	.012 (.305)	.012 (.305)	.012 (.305)
WIDTH	.004 (.102)	.006 (.152)	.006 (.152)	.008 (.203)	.008 (.203)	.008 (.203)	.008 (.203)	.008 (.203)	.015 (.381)	.008 (.203)	.008 (.203)	.015 (.381)
MB	.006 (.152)	.006 (.152)	.006 (.152)	.010 (.254)	.010 (.254)	.010 (.254)	.010 (.254)	.010 (.254)	.015 (.381)	.014 (.356)	.014 (.356)	.014 (.356)

DIMENSIONS INCHES (MM)

SIZE	2020	2221	2225	2520	3333	3530	4040	4540	5440	5550	6560	7565
LENGTH L	.200 (5.08)	.220 (5.59)	.220 (5.59)	.250 (6.35)	.330 (8.38)	.350 (8.89)	.400 (10.2)	.450 (11.4)	.540 (13.7)	.550 (14.0)	.650 (16.5)	.750 (19.1)
WIDTH W	.200 (5.08)	.210 (5.33)	.250 (6.35)	.200 (5.08)	.330 (8.38)	.300 (7.62)	.400 (10.2)	.400 (10.2)	.400 (10.2)	.500 (12.7)	.600 (15.2)	.650 (16.5)
T MAX.	.180 (4.57)	.080 (2.03)	.080 (2.03)	.180 (4.57)	.250 (6.35)	.250 (6.35)	.300 (7.62)	.300 (7.62)	.300 (7.62)	.300 (7.62)	.300 (7.62)	.300 (7.62)
MB	.024 (.610)	.030 (.762)	.030 (.762)	.030 (.762)	.030 (.762)	.030 (.762)	.040 (1.02)	.040 (1.02)	.040 (1.02)	.040 (1.02)	.040 (1.02)	.040 (1.02)

TOLERANCE +/- INCHES (MM)

LENGTH	.015 (.381)	.015 (.381)	.015 (.381)	.015 (.381)	.017 (.432)	.018 (.457)	.020 (.508)	.023 (.584)	.027 (.686)	.028 (.711)	.033 (.838)	.038 (.965)
WIDTH	.015 (.381)	.015 (.381)	.015 (.381)	.015 (.381)	.017 (.432)	.015 (.381)	.020 (.508)	.020 (.508)	.020 (.508)	.025 (.635)	.030 (.762)	.033 (.838)
MB	.014 (.356)	.015 (.381)	.015 (.381)	.015 (.381)	.015 (.381)	.015 (.381)	.020 (.508)	.020 (.508)	.020 (.508)	.020 (.508)	.020 (.508)	.020 (.508)

NOVACAP - 25136 Anza Drive -Valencia CA 91355
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Z5U & Y5V DIELECTRICS

General purpose EIA Class III dielectrics with +22% to -56% (Z5U) and +22% -82% (Y5V) temperature coefficients and very high capacitance density. The NOVACAP Z5U and Y5V formulations are very stable with time, typically aging less than 2% per decade. General purpose chips are used in by-pass and decoupling functions and other applications where capacitance change over the operating temperature range is not critical.

COMMERCIAL SMT CHIPS

CAPACITANCE & VOLTAGE SELECTION

3 digit code: two significant digits, followed by number of zeros eg: 473 = 47,000 pF

Z5U DIELECTRIC

MAX CAP & VOLTAGE

SIZE	0402	0504	0603	0805	1005	1206	1210	1808	1812	1825	2221	2225
Min Cap	121	121	121	471	681	681	681	222	332	103	103	103
16V	563	474	334	125	185	225	475	565	106	226	186	226
25V	473	394	224	105	155	225	395	395	685	186	156	226
50V	333	224	154	684	105	185	335	335	565	156	126	186
100V	103	823	563	224	334	474	105	105	185	395	395	475
200V	682	223	153	563	823	154	334	334	564	155	155	185
250V	222	183	123	473	683	104	224	224	394	105	105	125

Y5V DIELECTRIC

MAX CAP & VOLTAGE

SIZE	0402	0504	0603	0805	1005	1206	1210	1808	1812	1825	2221	2225
Min Cap	121	121	121	471	681	681	681	222	332	103	103	103
16V	563	474	334	125	185	225	475	565	106	226	186	226
25V	473	394	224	105	155	225	395	395	685	186	156	226
50V	333	224	154	684	105	185	335	335	565	156	126	186
100V	103	823	563	224	334	474	105	105	185	395	395	475
200V	682	223	153	563	823	154	334	334	564	155	155	185
250V	222	183	123	473	683	104	224	224	394	105	105	125

NOTE: REFER TO PAGES 10 & 11 FOR ORDERING INFORMATION

STANDARD SMT CHIP P/N BREAKDOWN

1206 N 472 J 101 N X050 H T M

Case Size

Dielectric Code

Code	EIA	Class
N	COG/NP0	Ultra Stable
B	X7R	Stable
X	BX	MIL
Y	Y5V	General Purpose
Z	Z5U	General Purpose
S	X8R	High Temp up to 150ºC
D	COG/NPO	High Temp up to 200°C
E	Class II (Stable)	High Temp up to 200°C

Capacitance

1st two digits are significant, third digit denotes number of zeros, R= decimal
Examples:
1R0 = 1.0 pF
120 = 12 pF
471 = 470 pF
102 = 1,000 pF
273 = .027 µF
474 = 0.47 µF
105 = 1.0 µF

Capacitance Tolerance

Code		COG NPO	X7R	BX	Z5U Y5V	X8R 150°C	D 200°C	E 200°C
Cap Value < 10pF B	±0.10pF							
C	±0.25pF							
D	±0.50pF							
F	± 1%pF							
G	± 2%pF							
J	± 5%pF							
K	±10%pF							
M	±20%pF							
Z	+80% -20%							
P	+100%/-0%							

Marking

M = Marked
None = Unmarked
Marking not available on sizes 0603 and below

Packaging

T= Tape and Reel
W = Waffle Pack
None = Bulk

High Reliability Testing

H = High Reliablity Testing Required
None = Standard SMT, no High-Rel
Consult catalog to determine MIL SPEC required.

Special Thickness

X in the part number denotes a special thickness other than standard. Specify in mils if required. (As shown above X=.050")
If no **X** in the part number then thickness is standard per Novacap catalog specifications.

Termination

N = Nickel Barrier (100% Tin)
P = Palladium Silver
Y= Nickel Barrier (90%Tin/10%Lead)
S= Silver
C = Polymer with Nickel Barrier (100% Tin)
D = Polymer with Nickel Barrier (90%Tin/10%Lead)
V = Non-Solderable Silver

Voltage

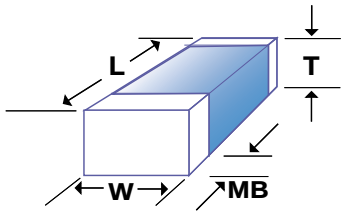
Examples:

160 = 16 Volts	202 = 2000 Volts
250 = 25 Volts	302 = 3000 Volts
500 = 50 Volts	402 = 4000 Volts
101 = 100 Volts	502 = 5000 Volts
251 = 250 Volts	602 = 6000 Volts
501 = 500 Volts	802 = 8000 Volts
102 = 1000 Volts	103 = 10,000 Volts

This ordering information relates to NOVACAP's standard surface mount capacitors. Please refer to the specific catalog pages for ordering information for our application specific products; ie: Stacked, Leaded, Capacitor Arrays, Pulsed Power capacitors and other specialty products.

PART NUMBER PREFIX DEFINITIONS

LS = Y3 Certified Safety Capacitor	pg. 36
ES = Y2 Certified Safety Capacitor	pg. 37
AP = Arc Prevention Capacitor	pg. 50
CR = Cap-Rack Capacitor Array	pg. 40 - 41
RD = Ring Detect Capacitor	pg. 38
ST = Stacked Capacitor Assembly	pg. 48 - 49
SM = Hi-Rel Stacked Capacitor Assembly	pg. 48 - 49



CODE COMBINATIONS

Dielectric Code	Max. Temp. Rated	Terminations (allowed)
N (COG/NPO)	125º	N, P, Y, S, V
B (X7R)	125º	N, P, Y, C, D, S, V
X (BX)	125º	N, P, Y, C, D, S, V
Y (Y5V)	125º	N, Y, C, D
Z (Z5U)	125º	N, Y, C, D
D (NPO-HIGH TEMP)	200º	P, S, V
E (CLASS 11-HIGH TEMP)	200º	P, S, V
F (NPO-HIGH TEMP)	160º	N, P, Y, S, V
G (CLASS 11-HIGH TEMP)	160º	N, P, Y, S, V
S (X8R)	150º	N, P, Y, S, V
P (PULSE POWER)	125º	P
R (R2D)	200º	P

DIMENSIONS INCHES (MM)

SIZE	0402	0504	0603	0805	0907	1005	1206	1210	1515	1808	1812	1825
LENGTH L	.040 (1.02)	.050 (1.27)	.060 (1.52)	.080 (2.03)	.090 (2.29)	.100 (2.54)	.125 (3.18)	.125 (3.18)	.150 (3.81)	.180 (4.57)	.180 (4.57)	.180 (4.57)
WIDTH W	.020 (.508)	.040 (1.02)	.030 (.762)	.050 (1.27)	.070 (1.78)	.050 (1.27)	.060 (1.52)	.100 (2.54)	.150 (3.81)	.080 (2.03)	.125 (3.18)	.250 (6.35)
T MAX.	.024 (.610)	.044 (1.12)	.035 (.889)	.054 (1.37)	.054 (1.37)	.054 (1.37)	.064 (1.63)	.065 (1.65)	.130 (3.30)	.065 (1.65)	.065 (1.65)	.080 (2.03)
MB	.010 (.254)	.014 (.356)	.014 (.356)	.020 (.508)	.020 (.508)	.020 (.508)	.020 (.508)	.020 (.508)	.040 (1.02)	.024 (.610)	.024 (.610)	.024 (.610)

TOLERANCE +/- INCHES (MM)

LENGTH	.004 (.102)	.006 (.152)	.006 (.152)	.008 (.203)	.008 (.203)	.008 (.203)	.008 (.203)	.008 (.203)	.015 (.381)	.012 (.305)	.012 (.305)	.012 (.305)
WIDTH	.004 (.102)	.006 (.152)	.006 (.152)	.008 (.203)	.008 (.203)	.008 (.203)	.008 (.203)	.008 (.203)	.015 (.381)	.008 (.203)	.008 (.203)	.015 (.381)
MB	.006 (.152)	.006 (.152)	.006 (.152)	.010 (.254)	.010 (.254)	.010 (.254)	.010 (.254)	.010 (.254)	.015 (.381)	.014 (.356)	.014 (.356)	.014 (.356)

DIMENSIONS INCHES (MM)

SIZE	2020	2221	2225	2520	3333	3530	4040	4540	5440	5550	6560	7565
LENGTH L	.200 (5.08)	.220 (5.59)	.220 (5.59)	.250 (6.35)	.330 (8.38)	.350 (8.89)	.400 (10.2)	.450 (11.4)	.540 (13.7)	.550 (14.0)	.650 (16.5)	.750 (19.1)
WIDTH W	.200 (5.08)	.210 (5.33)	.250 (6.35)	.200 (5.08)	.330 (8.38)	.300 (7.62)	.400 (10.2)	.400 (10.2)	.400 (10.2)	.500 (12.7)	.600 (15.2)	.650 (16.5)
T MAX.	.180 (4.57)	.080 (2.03)	.080 (2.03)	.180 (4.57)	.250 (6.35)	.250 (6.35)	.300 (7.62)	.300 (7.62)	.300 (7.62)	.300 (7.62)	.300 (7.62)	.300 (7.62)
MB	.024 (.610)	.030 (.762)	.030 (.762)	.030 (.762)	.030 (.762)	.030 (.762)	.040 (1.02)	.040 (1.02)	.040 (1.02)	.040 (1.02)	.040 (1.02)	.040 (1.02)

TOLERANCE +/- INCHES (MM)

LENGTH	.015 (.381)	.015 (.381)	.015 (.381)	.015 (.381)	.017 (.432)	.018 (.457)	.020 (.508)	.023 (.584)	.027 (.686)	.028 (.711)	.033 (.838)	.038 (.965)
WIDTH	.015 (.381)	.015 (.381)	.015 (.381)	.015 (.381)	.017 (.432)	.015 (.381)	.020 (.508)	.020 (.508)	.020 (.508)	.025 (.635)	.030 (.762)	.033 (.838)
MB	.014 (.356)	.015 (.381)	.015 (.381)	.015 (.381)	.015 (.381)	.015 (.381)	.020 (.508)	.020 (.508)	.020 (.508)	.020 (.508)	.020 (.508)	.020 (.508)

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Z5U & Y5V DIELECTRICS

General purpose EIA Class III dielectrics with +22% to -56% (Z5U) and +22% -82% (Y5V) temperature coefficients and very high capacitance density. The NOVACAP Z5U and Y5V formulations are very stable with time, typically aging less than 2% per decade. General purpose chips are used in by-pass and decoupling functions and other applications where capacitance change over the operating temperature range is not critical.

COMMERCIAL SMT CHIPS

CAPACITANCE & VOLTAGE SELECTION

3 digit code: two significant digits, followed by number of zeros eg: 473 = 47,000 pF

Z5U DIELECTRIC

MAX CAP & VOLTAGE

SIZE	0402	0504	0603	0805	1005	1206	1210	1808	1812	1825	2221	2225
Min Cap	121	121	121	471	681	681	681	222	332	103	103	103
16V	563	474	334	125	185	225	475	565	106	226	186	226
25V	473	394	224	105	155	225	395	395	685	186	156	226
50V	333	224	154	684	105	185	335	335	565	156	126	186
100V	103	823	563	224	334	474	105	105	185	395	395	475
200V	682	223	153	563	823	154	334	334	564	155	155	185
250V	222	183	123	473	683	104	224	224	394	105	105	125

Y5V DIELECTRIC

MAX CAP & VOLTAGE

SIZE	0402	0504	0603	0805	1005	1206	1210	1808	1812	1825	2221	2225
Min Cap	121	121	121	471	681	681	681	222	332	103	103	103
16V	563	474	334	125	185	225	475	565	106	226	186	226
25V	473	394	224	105	155	225	395	395	685	186	156	226
50V	333	224	154	684	105	185	335	335	565	156	126	186
100V	103	823	563	224	334	474	105	105	185	395	395	475
200V	682	223	153	563	823	154	334	334	564	155	155	185
250V	222	183	123	473	683	104	224	224	394	105	105	125

NOTE: REFER TO PAGES 10 & 11 FOR ORDERING INFORMATION

STANDARD SMT CHIP P/N BREAKDOWN

1206 N 472 J 101 N X050 H T M

Case Size

Dielectric Code

Code	EIA	Class
N	COG/NP0	Ultra Stable
B	X7R	Stable
X	BX	MIL
Y	Y5V	General Purpose
Z	Z5U	General Purpose
S	X8R	High Temp up to 150ºC
D	COG/NPO	High Temp up to 200°C
E	Class II (Stable)	High Temp up to 200°C

Capacitance

1st two digits are significant, third digit denotes number of zeros, R= decimal
Examples:
1R0 = 1.0 pF
120 = 12 pF
471 = 470 pF
102 = 1,000 pF
273 = .027 µF
474 = 0.47 µF
105 = 1.0 µF

Capacitance Tolerance

Code		COG NPO	X7R	BX	Z5U Y5V	X8R 150°C	D 200°C	E 200°C
Cap Value < 10pF B	±0.10pF							
C	±0.25pF							
D	±0.50pF							
F	± 1%pF							
G	± 2%pF							
J	± 5%pF							
K	±10%pF							
M	±20%pF							
Z	+80% -20%							
P	+100%/-0%							

Marking

M = Marked
None = Unmarked
Marking not available on sizes 0603 and below

Packaging

T= Tape and Reel
W = Waffle Pack
None = Bulk

High Reliability Testing

H = High Reliablity Testing Required
None = Standard SMT, no High-Rel
Consult catalog to determine MIL SPEC required.

Special Thickness

X in the part number denotes a special thickness other than standard. Specify in mils if required. (As shown above X=.050")
If no **X** in the part number then thickness is standard per Novacap catalog specifications.

Termination

N = Nickel Barrier (100% Tin)
P = Palladium Silver
Y= Nickel Barrier (90%Tin/10%Lead)
S= Silver
C = Polymer with Nickel Barrier (100% Tin)
D = Polymer with Nickel Barrier (90%Tin/10%Lead)
V = Non-Solderable Silver

Voltage

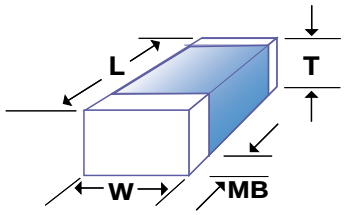
Examples:

160 = 16 Volts	202 = 2000 Volts
250 = 25 Volts	302 = 3000 Volts
500 = 50 Volts	402 = 4000 Volts
101 = 100 Volts	502 = 5000 Volts
251 = 250 Volts	602 = 6000 Volts
501 = 500 Volts	802 = 8000 Volts
102 = 1000 Volts	103 = 10,000 Volts

This ordering information relates to NOVACAP's standard surface mount capacitors. Please refer to the specific catalog pages for ordering information for our application specific products; ie: Stacked, Leaded, Capacitor Arrays, Pulsed Power capacitors and other specialty products.

PART NUMBER PREFIX DEFINITIONS

LS = Y3 Certified Safety Capacitor	pg. 36
ES = Y2 Certified Safety Capacitor	pg. 37
AP = Arc Prevention Capacitor	pg. 50
CR = Cap-Rack Capacitor Array	pg. 40 - 41
RD = Ring Detect Capacitor	pg. 38
ST = Stacked Capacitor Assembly	pg. 48 - 49
SM = Hi-Rel Stacked Capacitor Assembly	pg. 48 - 49



CODE COMBINATIONS

Dielectric Code	Max. Temp. Rated	Terminations (allowed)
N (COG/NPO)	125º	N, P, Y, S, V
B (X7R)	125º	N, P, Y, C, D, S, V
X (BX)	125º	N, P, Y, C, D, S, V
Y (Y5V)	125º	N, Y, C, D
Z (Z5U)	125º	N, Y, C, D
D (NPO-HIGH TEMP)	200º	P, S, V
E (CLASS 11-HIGH TEMP)	200º	P, S, V
F (NPO-HIGH TEMP)	160º	N, P, Y, S, V
G (CLASS 11-HIGH TEMP)	160º	N, P, Y, S, V
S (X8R)	150º	N, P, Y, S, V
P (PULSE POWER)	125º	P
R (R2D)	200º	P

DIMENSIONS INCHES (MM)

SIZE	0402	0504	0603	0805	0907	1005	1206	1210	1515	1808	1812	1825
LENGTH L	.040 (1.02)	.050 (1.27)	.060 (1.52)	.080 (2.03)	.090 (2.29)	.100 (2.54)	.125 (3.18)	.125 (3.18)	.150 (3.81)	.180 (4.57)	.180 (4.57)	.180 (4.57)
WIDTH W	.020 (.508)	.040 (1.02)	.030 (.762)	.050 (1.27)	.070 (1.78)	.050 (1.27)	.060 (1.52)	.100 (2.54)	.150 (3.81)	.080 (2.03)	.125 (3.18)	.250 (6.35)
T MAX.	.024 (.610)	.044 (1.12)	.035 (.889)	.054 (1.37)	.054 (1.37)	.054 (1.37)	.064 (1.63)	.065 (1.65)	.130 (3.30)	.065 (1.65)	.065 (1.65)	.080 (2.03)
MB	.010 (.254)	.014 (.356)	.014 (.356)	.020 (.508)	.020 (.508)	.020 (.508)	.020 (.508)	.020 (.508)	.040 (1.02)	.024 (.610)	.024 (.610)	.024 (.610)

TOLERANCE +/- INCHES (MM)

LENGTH	.004 (.102)	.006 (.152)	.006 (.152)	.008 (.203)	.008 (.203)	.008 (.203)	.008 (.203)	.008 (.203)	.015 (.381)	.012 (.305)	.012 (.305)	.012 (.305)
WIDTH	.004 (.102)	.006 (.152)	.006 (.152)	.008 (.203)	.008 (.203)	.008 (.203)	.008 (.203)	.008 (.203)	.015 (.381)	.008 (.203)	.008 (.203)	.015 (.381)
MB	.006 (.152)	.006 (.152)	.006 (.152)	.010 (.254)	.010 (.254)	.010 (.254)	.010 (.254)	.010 (.254)	.015 (.381)	.014 (.356)	.014 (.356)	.014 (.356)

DIMENSIONS INCHES (MM)

SIZE	2020	2221	2225	2520	3333	3530	4040	4540	5440	5550	6560	7565
LENGTH L	.200 (5.08)	.220 (5.59)	.220 (5.59)	.250 (6.35)	.330 (8.38)	.350 (8.89)	.400 (10.2)	.450 (11.4)	.540 (13.7)	.550 (14.0)	.650 (16.5)	.750 (19.1)
WIDTH W	.200 (5.08)	.210 (5.33)	.250 (6.35)	.200 (5.08)	.330 (8.38)	.300 (7.62)	.400 (10.2)	.400 (10.2)	.400 (10.2)	.500 (12.7)	.600 (15.2)	.650 (16.5)
T MAX.	.180 (4.57)	.080 (2.03)	.080 (2.03)	.180 (4.57)	.250 (6.35)	.250 (6.35)	.300 (7.62)	.300 (7.62)	.300 (7.62)	.300 (7.62)	.300 (7.62)	.300 (7.62)
MB	.024 (.610)	.030 (.762)	.030 (.762)	.030 (.762)	.030 (.762)	.030 (.762)	.040 (1.02)	.040 (1.02)	.040 (1.02)	.040 (1.02)	.040 (1.02)	.040 (1.02)

TOLERANCE +/- INCHES (MM)

LENGTH	.015 (.381)	.015 (.381)	.015 (.381)	.015 (.381)	.017 (.432)	.018 (.457)	.020 (.508)	.023 (.584)	.027 (.686)	.028 (.711)	.033 (.838)	.038 (.965)
WIDTH	.015 (.381)	.015 (.381)	.015 (.381)	.015 (.381)	.017 (.432)	.015 (.381)	.020 (.508)	.020 (.508)	.020 (.508)	.025 (.635)	.030 (.762)	.033 (.838)
MB	.014 (.356)	.015 (.381)	.015 (.381)	.015 (.381)	.015 (.381)	.015 (.381)	.020 (.508)	.020 (.508)	.020 (.508)	.020 (.508)	.020 (.508)	.020 (.508)

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