Certified Safety Capacitors X^2, Y^3 & X^1, Y^2

X^2, Y^3 (LS style) and X^1, Y^2 (ES style) Class Compliant* chip capacitors specifically designed for use in modem, facsimile, telephone and other electronic equipment where lightning or overvoltage surges can occur. Both styles are rated at 250 Vac safety approved with C0G (NP0) and X7R dielectrics available (dependant on style).

X^2, Y^3 (LS style) is certified to EN 60950 and compliant to Standards EN 132400: 1994/A2: 1998/IEC60384-14, Second Edition: 1993/A1:1995.

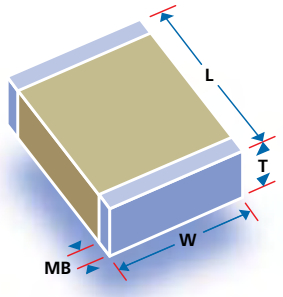
X^1, Y^2 (ES style) is certified to IEC60384-14, Second Edition: 1993/A1:1995 and compliant to Standards EN 132400: 1994/A2:1998.

Both styles meet the requirements of EN61000-4-5, IEC1000-4-5 and IEC801-4-5.

Certification numbers

Safety Classification	X^2,Y^3	X^1, Y^2
TUV	LS1808N, LS1812N - *T72140287.01 LS1808B - *T72140286.01	ES 1808 - R60012089 ES 2211, ES 2215 - R2072738.01 ES 2225 - R2072738.02
Standards	EN 132400, EN 60950, IEC 60384-14 2nd Edition, Class X^2 Y^3.	EN 132400, IEC 60384-14 2nd Edition, Class X^1 Y^2
UL	NWGQ2.E208336 and NWGQ8.E208336	

*LS style is compliant with Robustness of Termination (cl 4.3) test according to IEC 60384-1 amendment 3 cl 4.34 and 4.35 Resistance to Soldering Heat (cl 4.4) tested according to IEC 60384-1 amendment 3 cl. 4.14.2, Impulse Test made with 2.5 KV or 5.0KV as required according to 6.4.2.1 in EN 60950. The creepage distance between live parts of different polarity meets the requirements of IEC 60950.



Dimensions - inches/mm

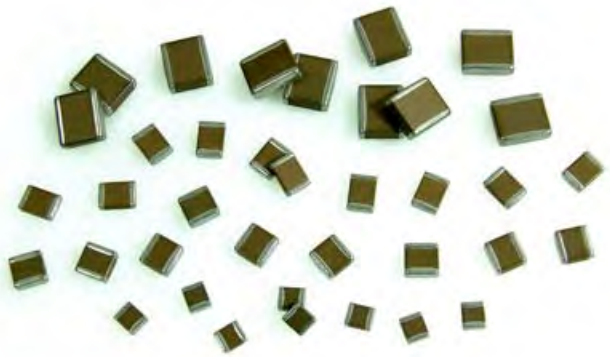
Safety Classification	X^2,Y^3		X^1, Y^2			
Size	LS 1808	LS 1812	ES 1808	ES 2211	ES 2215	ES 2225
L inches ±0.015/0.38: mm ±0.015/0.38:	0.180 4.57	0.180 4.57	0.180* 4.57	0.220 5.58	0.220 5.58	0.220 5.58
W inches ±0.02: mm ±0.508:	0.080 2.03	0.125 3.18	0.080** 2.03	0.110 2.79	0.150 3.81	0.250 6.35
MB typical inches: mm:	0.024 0.609	0.024 0.609	0.020 5.08	0.300 0.762	0.300 0.762	0.300 0.762
Creepage min inches: mm:	0.102 2.60	0.102 2.60	0.100 2.50	0.157 3.99	0.157 3.99	0.157 3.99

*Tolerance is ±0.014/0.35 **Tolerance is ±0.012/0.30

How to Order - Certified Safety Capacitors

LS	1808	N	122	K	302	N	X080	T	M
STYLE LS = X^2, Y^3 ES = X^1, Y^2	**SIZE** See Chart	**DIELECTRIC** N = C0G B = X7R	**CAPACITANCE** Value in Picofarads. Two significant figures, followed by number of zeros: 121 = 120pF	**TOLERANCE** J = ± 5% K = ± 10% M = ± 20%	**VOLTAGE-SURGE** Two significant figures, followed by number of zeros: 302 = 3000V (X^2, Y^3) 502 = 5000V (X^1, Y^2)	**TERMINATION** N = Nickel Barrier	**THICKNESS OPTION** Blank = Standard thickness X = special thickness, specified in inches: X080 = 0.08″ X100 = 0.10″ X010 = 0.11″ X150 = 0.15″	**PACKING** No suffix = Bulk T = Tape & Reel	**MARKING** Parts marked: NLS (X^2, Y^3) NY2 (X^1, Y^2)

Certified Safety Capacitors X^2, Y^3 & X^1, Y^2



- For dielectric characteristics see page 4 & 7.
- Nickel Barrier terminations.
- Capacitance tolerances available ±5%, ±10%, ±20%

Note: Capacitance values are shown below as 3 digit code: 2 significant figures followed by the no. of zeros e.g. 183 = 18,000pF.

Capacitance values

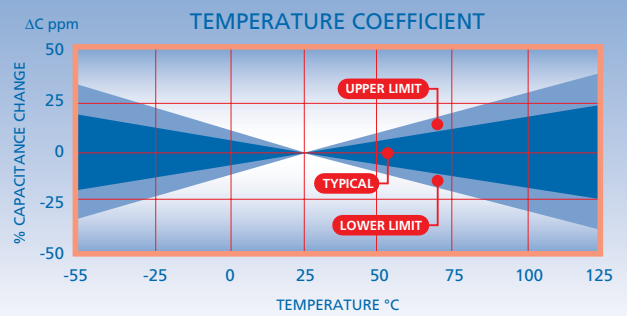
Safety Classification	X^2,Y^3					X^1, Y^2				
Size	LS 1808			LS 1812		ES 1808		ES 2211	ES 2215	ES 2225
Tmax inches: / mm:	0.065 / 1.65	0.080* / 2.03	0.065 / 1.65	0.065 / 1.65	0.100* / 2.54	0.080* / 2.03		0.150* / 4.00	0.150* / 4.00	0.150* / 4.00
Dielectric	C0G/NP0		X7R	C0G/NP0		C0G/NP0	X7R	C0G/NP0	C0G/NP0	C0G/NP0
4R7						•				
5R0	•					•		•		
6R8	•					•		•		
8R2	•					•		•		
100	•					•		•		
120	•					•		•		
150	•					•		•		
180	•					•		•		
220	•					•		•		
270	•					•		•		
330	•					•		•		
390	•					•		•		
470	•					•		•		
560	•					•		•		
680	•					•		•		
820	•					•		•		
101	•					•		•		
121	•					•		•		
151	•		•			•	•	•		
181	•		•			•	•	•		
221	•		•			•	•	•		
271	•		•				•	•		
331	•		•				•	•		
391	•		•				•	•		
471	•		•				•	•		
561	•		•				•	•		
681	•		•				•	•		
821		•	•				•			
102		•	•	•			•		•	•
122			•	•						
152			•	•						
182					•					
222					•					

* Denotes non standard chip thickness.
Order code needs to have an'X' inserted together with the dimension in inches -e.g. X080 where dimension is 0.080"

Dielectric Characteristics

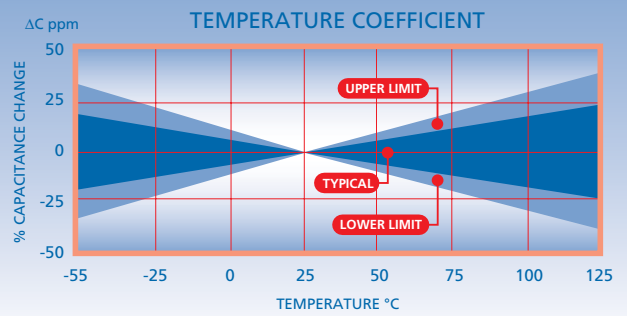
C0G/NP0 (N) Ultra Stable and RoHS 2013 (RN) type

Operating temperature range:		-55°C to 125°C
Temperature coefficient:		0 ±30 ppm/°C
Dissipation factor:		0.1% max @ 25°C
Insulation resistance	@25°C: @125°C:	>100GΩ or >1000ΩF whichever is less >10GΩ or >100ΩF whichever is less
Dielectric withstanding voltage	≤200V: 201-500V: >500V:	250% 150% or 500V whichever is greater 120% or 750V whichever is greater
Ageing rate:		0% per decade
Test parameters:		1KHz, 1.0 ±0.2 VRMS, 25°C 1MHz for Capacitance ≤100pF



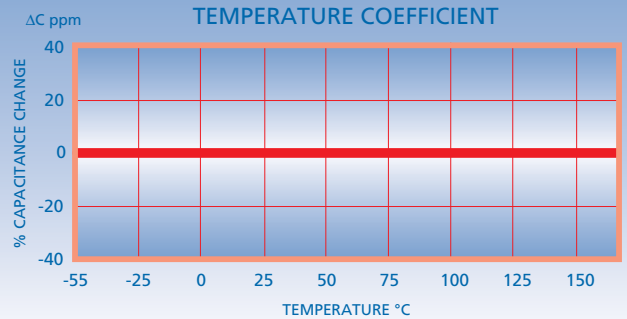
C0G/NP0 (M) Ultra Stable Non Magnetic

Operating temperature range:		-55°C to 125°C
Temperature coefficient:		0 ±30 ppm/°C
Dissipation factor:		0.1% max @ 25°C
Insulation resistance	@25°C: @125°C:	>1000ΩF or >10000ΩF whichever is less >100ΩF or >1000ΩF whichever is less
Dielectric withstanding voltage	≤200V: 201-500V: >500V:	250% 150% or 500V whichever is greater 120% or 750V whichever is greater
Ageing rate:		0% per decade
Test parameters:		1KHz, 1.0 ±0.2 VRMS, 25°C 1MHz for Capacitance ≤100pF



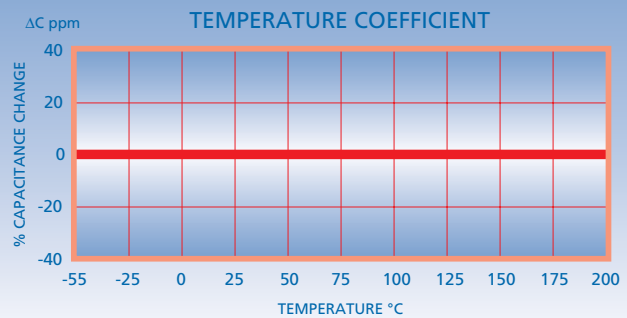
C0G/NP0 (F) Ultra Stable High Temperature (up to 160°C)

Operating temperature range:		-55°C to 160°C
Temperature coefficient:		0 ±30 ppm/°C
Dissipation factor:		0.1% max @ 25°C
Insulation resistance	@25°C: @160°C:	>100GΩ or >1000ΩF whichever is less >1GΩ or >10ΩF whichever is less
Dielectric withstanding voltage	<200V: 201-500V: >500V:	250% 150% or 500V whichever is greater 120% or 750V whichever is greater
Ageing rate:		0% per decade
Test parameters:		1KHz, 1.0 ±0.2 VRMS, 25°C 1MHz for Capacitance ≤100pF



C0G/NP0 (D) Ultra Stable High Temperature (up to 200°C)

Operating temperature range:		-55°C to 200°C
Temp. coefficient ≤200°C:		0 ±30 ppm/°C
Dissipation factor @ 25°C:		0.1% Max.
Insulation resistance	@25°C: @200°C:	>100GΩ or >1000ΩF whichever is less >1GΩ or >10ΩF whichever is less
Dielectric withstanding voltage	≤200V: 201-500V: >500V:	250% 150% or 500V whichever is greater 120% or 750V whichever is greater
Ageing rate:		0% per decade
Test parameters:		1KHz, 1.0 ±0.2 VRMS, 25°C 1MHz for capacitance ≤100pF



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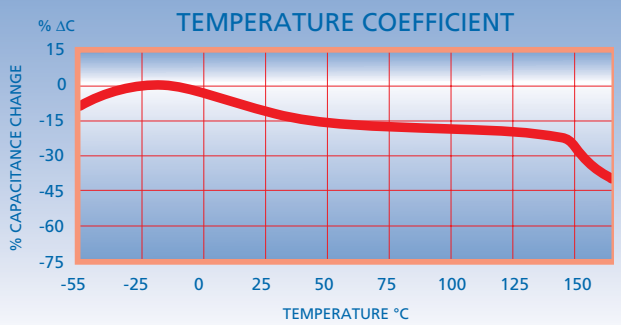
Dielectric Characteristics

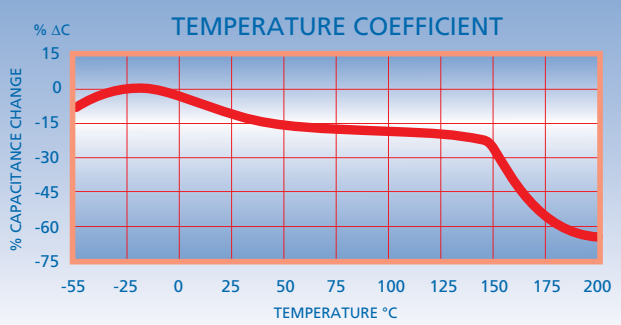
Class II (G) Stable High Temperature (up to 160°C)

Operating temperature range:		-55°C to 160°C
Temperature coefficient up to 160°C:		+15 -40% ΔC Max.
Dissipation factor @ 25°C:		2.5% Max.
Insulation resistance	@25°C: @160°C:	>100GΩ or >1000ΩF whichever is less >1GΩ or >10ΩF whichever is less
Dielectric withstanding voltage	≤200V: 201-500V: >500V:	250% 150% or 500V whichever is greater 120% or 750V whichever is greater
Ageing rate:		< 2.0% per decade
Test parameters:		1KHz, 1.0 ±0.2 VRMS, 25°C



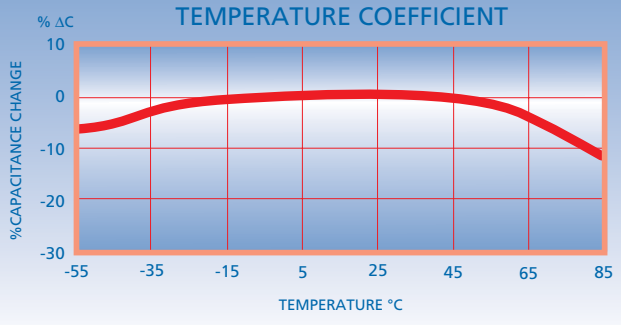
Class II (E) Stable High Temperature (up to 200°C)

Operating temperature range:		-55°C to 200°C
Temperature coefficient up to 200°C:		+15 -65% ΔC Max.
Dissipation factor @ 25°C:		2.5% Max.
Insulation resistance	@25°C: @200°C:	>100GΩ or >1000ΩF whichever is less >1GΩ or >10ΩF whichever is less
Dielectric withstanding voltage	≤200V: 201-500V: >500V:	250% 150% or 500V whichever is greater 120% or 750V whichever is greater
Ageing rate:		< 2.0% per decade
Test parameters:		1KHz, 1.0 ±0.2 VRMS, 25°C

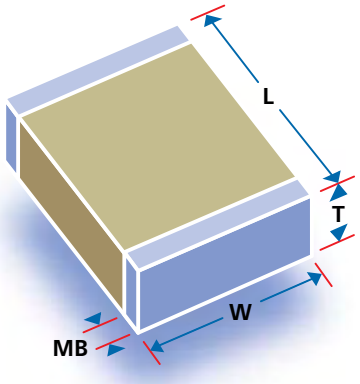


X5R (W) Stable

Operating temperature range:	-55°C to 85°C
Temperature coefficient up to 200°C:	±15% ΔC Max.
Dissipation factor @ 25°C:	5% Max.
Insulation resistance @25%:	>10GΩ or >500ΩF whichever is less
Dielectric withstanding voltage:	250%
Ageing rate:	< 5.0% per decade
Test parameters: Except: 22µF, 47µF & 100µF	1KHz, 1.0 ±0.2 VRMS, 25°C 120KHz, 0.5 ±0.1 VRMS, 25°C



Chip Dimensions



Dimensions - inches (mm)

Size	Length (L)	Width (W)	Max. Thickness (T)*	Termination Band (MB)
0402	0.040 ± 0.004 (1.02 ± 0.102)	0.020 ± 0.004 (0.508 ± 0.102)	0.024 (0.610)	0.010 ± 0.006 (0.254 ± 0.152)
0504	0.050 ± 0.006 (1.27 ± 0.152)	0.040 ± 0.006 (1.02 ± 0.152)	0.044 (1.12)	0.014 ± 0.006 (0.356 ± 0.152)
RF0505	0.055 +0.015 -0.010 (1.4 +0.38 -0.25)	0.055 ± 0.015 (1.40 ± 0.381)	0.057 (1.45)	0.014 ± 0.006 (0.356 ± 0.152)
0603	0.060 ± 0.006 (1.52 ± 0.152)	0.030 ± 0.006 (0.762 ± 0.152)	0.035 (0.889)	0.014 ± 0.006 (0.356 ± 0.152)
0805	0.080 ± 0.008 (2.03 ± 0.203)	0.050 ± 0.008 (1.27 ± 0.203)	0.054 (1.37)	0.020 ± 0.010 (0.508 ± 0.254)
0907	0.090 ± 0.008 (2.29 ± 0.203)	0.070 ± 0.008 (1.78 ± 0.203)	0.060 (1.52)	0.020 ± 0.010 (0.508 ± 0.254)
1005	0.100 ± 0.008 (2.54 ± 0.203)	0.050 ± 0.008 (1.27 ± 0.203)	0.054 (1.37)	0.020 ± 0.010 (0.508 ± 0.254)
RF1111	0.110+0.025 -0.010 (2.79 +0.64 -0.25)	0.110 ± 0.015 (2.79 ± 0.381)	0.102 (2.59)	0.020 ± 0.010 (0.508 ± 0.254)
1206	0.125 ± 0.008 (3.18 ± 0.203)	0.060 ± 0.008 (1.52 ± 0.203)	0.064 (1.63)	0.020 ± 0.010 (0.508 ± 0.254)
1210	0.125 ± 0.008 (3.18 ± 0.203)	0.100 ± 0.008 (2.54 ± 0.203)	0.065 (1.65)	0.020 ± 0.010 (0.508 ± 0.254)
1515	0.150 ± 0.015 (3.81 ± 0.381)	0.150 ± 0.015 (3.81 ± 0.381)	0.130 (3.30)	0.030 ± 0.015 (0.762 ± 0.381)
1808	0.180 ± 0.012 (4.57 ± 0.305)	0.080 ± 0.008 (2.03 ± 0.203)	0.065 (1.65)	0.024 ± 0.014 (0.610 ± 0.356)
1812	0.180 ± 0.012 (4.57 ± 0.305)	0.125 ± 0.008 (3.18 ± 0.203)	0.065 (1.65)	0.024 ± 0.014 (0.610 ± 0.356)
1825	0.180 ± 0.012 (4.57 ± 0.305)	0.250 ± 0.015 (6.35 ± 0.381)	0.080 (2.03)	0.024 ± 0.014 (0.610 ± 0.356)
2020	0.200 ± 0.015 (5.08 ± 0.381)	0.200 ± 0.015 (5.08 ± 0.381)	0.180 (4.57)	0.024 ± 0.014 (0.610 ± 0.356)
2221	0.220 ± 0.015 (5.59 ± 0.381)	0.210 ± 0.015 (5.33 ± 0.381)	0.080 (2.03)	0.030 ± 0.015 (0.762 ± 0.381)
2225	0.220 ± 0.015 (5.59 ± 0.381)	0.250 ± 0.015 (6.35 ± 0.381)	0.080 (2.03)	0.030 ± 0.015 (0.762 ± 0.381)
2520	0.250 ± 0.015 (6.35 ± 0.381)	0.200 ± 0.015 (5.08 ± 0.381)	0.180 (4.57)	0.030 ± 0.015 (0.762 ± 0.381)
RF2525	0.230 +0.020 -0.012 (5.84 +0.51 -0.30)	0.250 ± 0.015 (6.35 ± 0.381)	0.165 (4.19)	0.030 ± 0.015 (0.762 ± 0.381)
3333	0.330 ± 0.017 (8.38 ± 0.432)	0.330 ± 0.017 (8.38 ± 0.432)	0.250 (6.35)	0.030 ± 0.015 (0.762 ± 0.381)
3530	0.350 ± 0.018 (8.89 ± 0.457)	0.300 ± 0.015 (7.62 ± 0.381)	0.250 (6.35)	0.030 ± 0.015 (0.762 ± 0.381)
4040	0.400 ± 0.020 (10.2 ± 0.508)	0.400 ± 0.020 (10.2 ± 0.508)	0.300 (7.62)	0.040 ± 0.020 (1.02 ± 0.508)
4540	0.450 ± 0.023 (11.4 ± 0.584)	0.400 ± 0.020 (10.2 ± 0.508)	0.300 (7.62)	0.040 ± 0.020 (1.02 ± 0.508)
5440	0.540 ± 0.027 (13.7 ± 0.686)	0.400 ± 0.020 (10.2 ± 0.508)	0.300 (7.62)	0.040 ± 0.020 (1.02 ± 0.508)
5550	0.550 ± 0.028 (14.0 ± 0.711)	0.500 ± 0.025 (12.7 ± 0.635)	0.300 (7.62)	0.040 ± 0.020 (1.02 ± 0.508)
6560	0.650 ± 0.033 (16.5 ± 0.838)	0.600 ± 0.030 (15.2 ± 0.762)	0.300 (7.62)	0.040 ± 0.020 (1.02 ± 0.508)
7565	0.750 ± 0.038 (19.1 ± 0.965)	0.650 ± 0.033 (16.5 ± 0.838)	0.300 (7.62)	0.040 ± 0.020 (1.02 ± 0.508)

* Non standard thicknesses are available - consult the sales office for details.