

High Temperature Caps - up to 150°C X8R, Commercial, AEC-Q200

The X8R dielectric will operate from -55°C to +150°C, with a maximum capacitance change $\pm 15\%$ (without applied voltage). The devices are available in sizes 0805 to 2225, with voltage ranges from 25V to 3kV and capacitance values from 100pF to 2.2 μ F.

The capacitors have been developed by Knowles to meet demand from various applications in the automotive and industrial markets and in other electronic equipment exposed to high temperatures. The increased use of electronics in automotive "under the hood" applications has created demand for this product range.

The X8R range incorporates a specially formulated termination with a nickel barrier finish that has been designed to enhance the mechanical performance of these SMD chip capacitors in harsh environments typically present in automotive applications.



Capacitance Range

100pF to 2.2 μ F (0805 to 2225)

Temperature Coefficient of Capacitance (TCC)

$\pm 15\%$ from -55°C to +150°C

Dissipation Factor (DF)

≤ 0.025

Termination

Nickel Barrier Tin Plated

Insulation Resistance (IR)

100G Ω or 1000secs (whichever is the less).

Dielectric Withstand Voltage (DWV)

2.5 x rated voltage for 5 \pm 1 seconds, 50mA charging current maximum.

Ageing Rate

1% per decade (typical)

X8R High Temperature Capacitors - minimum/maximum cap. values according to the rated d.c. voltage

	0805	1206	1210	1808	1812	2220	2225	4540*	7565*
Min cap	100pF	100pF	100pF	100pF	150pF	220pF	330pF	1nF	2.2nF
Min cap	220pF	220pF	220pF	220pF	220pF	220pF	330pF	5.6 μ F	15 μ F
50V	47nF	150nF	330nF	330nF	680nF	1.2 μ F	2.2 μ F	4.7 μ F	12 μ F
100V	33nF	100nF	220nF	220nF	470nF	1.0 μ F	1.5 μ F	3.9 μ F	10 μ F
200/250V	15nF	68nF	150nF	150nF	330nF	680nF	1.0 μ F	2.7 μ F	6.9 μ F
500V	4.7nF	22nF	47nF	47nF	120nF	330nF	470nF	1.2 μ F	3.2 μ F
630V	2.2nF	10nF	33nF	33nF	68nF	180nF	220nF	-	-
1kV	1.5nF	3.3nF	6.8nF	6.8nF	27nF	68nF	82nF	-	-
1.2kV		2.2nF	5.6nF	5.6nF	15nF	47nF	56nF	-	-
1.5kV		1.5nF	3.3nF	3.3nF	10nF	27nF	33nF	-	-
2kV		680pF	1.5nF	1.5nF	5.6nF	15nF	22nF	-	-
2.5kV				1.2nF	3.3nF	10nF	12nF	-	-
3kV				820pF	2.7nF	5.6nF	6.8nF	-	-

Notes: = X8R ranges in yellow available as qualified AEC-Q200. *Only available as Novacap parts, Non-RoHS compliant.

Ordering information - Syfer X8R High Temperature Capacitors

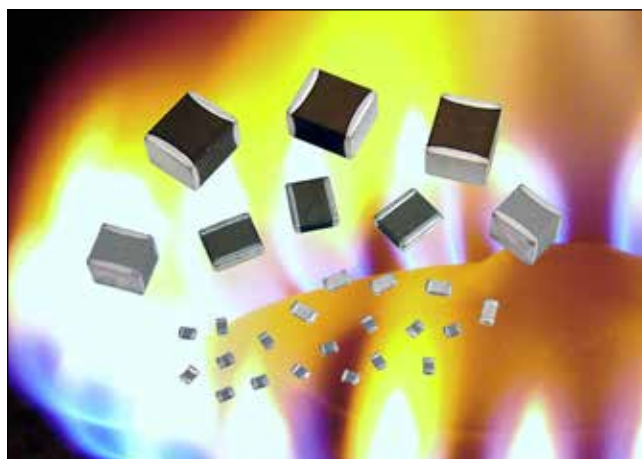
1206	Y	100	0473	K	N	T
Chip size	Termination	Voltage d.c.	Capacitance in picofarads (pF)	Capacitance tolerance	Dielectric codes	Packaging
0805 1206 1210 1808 1812 2220 2225	Y = FlexiCap™ termination base with nickel barrier (100% matte tin plating).	050 = 50V 100 = 100V 200 = 200V 250 = 250V 500 = 500V 630 = 630V 1K0 = 1kV 1K2 = 1.2kV 1K5 = 1.5kV 2K0 = 2kV 2K5 = 2.5kV 3K0 = 3kV	First digit is 0. Second and third digits are significant figures of capacitance code. The fourth digit is number of zeros following. Example: 0473 = 47000pF = 47nF	J = $\pm 5\%$ K = $\pm 10\%$ M = $\pm 20\%$	N = X8R T = X8R AEC-Q200 RoHS compliant.	T = 178mm (7") reel R = 330mm (13") reel B = Bulk pack - tubs or trays

Ordering information - Novacap High Temperature Capacitors

4540	S	125	K	501	N	T	M
Chip size	Dielectric codes	Capacitance in picofarads (pF)	Capacitance tolerance code	Voltage code	Termination codes	Packaging	Marking
0805 1206 1210 1812 1825 2225 4540 7565	S = X8R High Temp. (up to 150°C) Non-RoHS.	Value in Picofarads. Two significant figures, followed by number of zeros: 125 = 1.2nF	J = $\pm 5\%$ (X8R) K = $\pm 10\%$ (Class II) M = $\pm 20\%$ (Class II)	Two significant figures, followed by number of zeros: 250 = 25 Volts 500 = 50 Volts 101 = 100 Volts 251 = 250 Volts 501 = 500 Volts	P = Palladium Silver PR = Palladium Silver* K = Solderable Palladium Silver* N = Nickel Barrier* 100% tin Y = Nickel Barrier* 90% tin, 10% lead C = FlexiCap™/Nickel Barrier* 100% tin D = FlexiCap™/Nickel Barrier* 90% tin, 10% lead S = Solderable Silver* *Indicates RoHS terminations	None = Bulk T = Tape & Reel W = Waffle Pack	None = Unmarked M = Marked

High Temperature Caps - 160°C, 200°C

A range of chip capacitors, available in sizes 0805 to 7565, designed to operate from -55°C to 160°C, (Class II Dielectric) and from -55°C to 200°C (COG/NPO and Class II Dielectrics). Voltage ratings of 25V to 4kV.



Maximum capacitance values - 160°C COG (F)/Class II (G) and 200°C COG/NPO (D)/Class II (E) Dielectrics

Size	0805	1206	1210	1515	1808	1812	1825	2225	3530	4540	6560	7565
Tmax	0.054 1.37	0.064 1.63	0.065 1.65	0.130 3.30	0.065 1.65	0.065 1.65	0.080 2.03	0.080 2.03	0.250 6.35	0.300 7.62	0.300 7.62	0.300 7.62

Maximum capacitance values - COG/NPO - 160°C (F) and 200°C (D)

Min cap.	0R5	1R0	5R0	5R0	120	220	330	470	221	390	560	101
25V	2.7nF	5.6nF	12nF	22nF	12nF	22nF	56nF	56nF	100nF	180nF	330nF	390nF
50V	1.8nF	3.9nF	8.2nF	18nF	8.2nF	15nF	39nF	47nF	82nF	150nF	270nF	330nF
100V	680pF	1.8nF	3.3nF	10nF	3.3nF	8.2nF	15nF	18nF	56nF	100nF	220nF	270nF
250V	180pF	1.0nF	2.2nF	3.9nF	2.2nF	5.6nF	12nF	18nF	33nF	56nF	120nF	150nF
500V	100pF	390pF	820pF	2.7nF	1.0nF	2.2nF	3.9nF	5.6nF	12nF	27nF	56nF	68nF
1kV	47pF	100pF	220pF	820pF	220pF	560pF	820pF	1.0nF	5.6nF	15nF	33nF	39nF
2kV	•	27pF	56pF	180pF	56pF	120pF	180pF	270pF	1.5nF	3.3nF	8.2nF	10nF
3kV	•	•	•	82pF	22pF	56pF	82pF	100pF	560pF	1.5nF	3.3nF	3.9nF
4kV	•	•	•	47pF	12pF	27pF	33pF	47pF	330pF	820pF	1.8nF	2.2nF

Maximum capacitance values - Class II - 160°C (G) and 200°C (E)

Min cap.	121	121	121	151	151	151	471	471	102	102	222	222
25V	82nF	220nF	390nF	820nF	330nF	680nF	1.5µF	1.8µF	3.9µF	5.6µF	15µF	18µF
50V	47nF	120nF	220nF	680nF	270nF	470nF	1.0µF	1.2µF	2.7µF	4.7µF	12µF	15µF
100V	18nF	47nF	100nF	270nF	82nF	150nF	470nF	470nF	2.2µF	3.3µF	8.2µF	12µF
250V	4.7nF	10nF	27nF	68nF	22nF	47nF	120nF	150nF	560nF	1.2µF	2.7µF	3.9µF
500V	1.0nF	2.2nF	5.6nF	18nF	5.6nF	10nF	27nF	33nF	120nF	330nF	680nF	820nF
1kV	180pF	390pF	820pF	2.7nF	820pF	1.5nF	4.7nF	5.6nF	27nF	68nF	150nF	220nF
2kV	•	•	150pF	560pF	•	220pF	560pF	680pF	6.8nF	18nF	39nF	47nF
3kV	•	•	•	•	•	•	•	•	2.7nF	6.8nF	15nF	18nF
4kV	•	•	•	•	•	•	•	•	1.2nF	2.7nF	5.6nF	8.2nF

Ordering information - High Temperature Capacitors

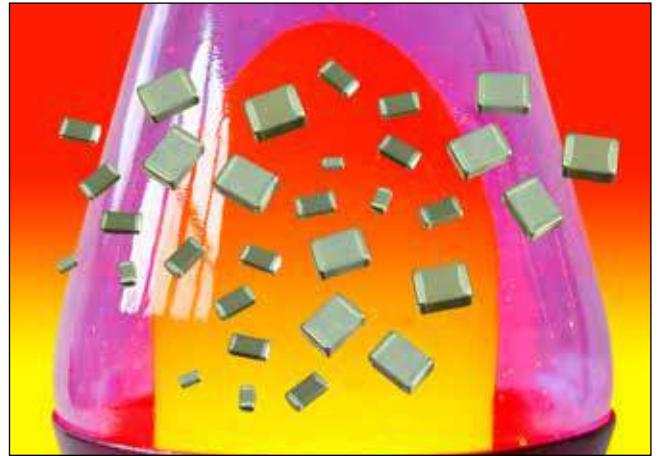
1206	G	224	K	250	N	X050	H	T	M
Chip size	Dielectric codes	Capacitance in picofarads (pF)	Capacitance tolerance code	Voltage code	Termination codes	Thickness options	High Reliability Testing	Packaging	Marking
0805 1206 1210 1515 1808 1812 1825 2225 3530 4540 6560 7565	F = COG/NPO High Temp. (up to 160°C) D = COG/NPO High Temp. (up to 200°C) E = Class II High Temp. (up to 200°C) G = Class II High Temp. (up to 160°C)	Value in Picofarads. Two significant figures, by number of zeros: 224 = 220nF (220,000pF)	F = ±1% (COG/NPO) G = ±2% (COG/NPO) J = ±5% (X8R) K = ±10% (Class II) M = ±20% (Class II)	Two significant figures, followed by number of zeros: 250 = 25 Volts	P = Palladium Silver PR = Palladium Silver* K = Solderable Palladium Silver* N = Nickel Barrier* 100% tin Y = Nickel Barrier* 90% tin, 10% lead C = FlexiCap™/Nickel Barrier* 100% tin D = FlexiCap™/Nickel Barrier* 90% tin, 10% lead S = Solderable Silver* *Indicates RoHS terminations Note: Nickel barrier not available in 200°C dielectric	Blank = Standard thickness "X" = Special thickness, specified in inches: X050 = 0.050"	High Temperature Screening	None = Bulk T = Tape & Reel W = Waffle Pack	None = Unmarked M = Marked *Marking not available on sizes <0603

High Temperature HiT range - 200°C - COG/NPO & X7R

The HiT range of multilayer ceramic capacitors is suitable for a variety of high temperature applications including: oil exploration, geothermal, military, automotive under-hood and avionics.

This range is manufactured to exacting standards using our unique screen printing process. This provides a high quality component suitable for demanding applications.

- 200°C operating temperature
- 0603 to 2220 chip sizes
- COG/NPO and X7R dielectric options
- Capacitance range COG/NPO from 4.7pF up to 47nF
- Capacitance range X7R from 100pF up to 4.7µF
- Voltage ratings from 10V to 630V
- RoHS compliant / Pb Free
- Sn over Ni termination
- Sample kits available



Temperature Coefficient of Capacitance (TCC)
COG/NPO 30ppm/°C to +125°C. X7R ±15% to +125°C

Ageing Rate
COG/NPO Zero. X7R X7R typically less than 2% per time decade.

Insulation Resistance (IR)

25°C >100GΩ or 1000secs (whichever is the less).

200°C >1GΩ or 10secs (whichever is the less).

Maximum capacitance values - High Temperature HiT range - 200°C COG/NPO & X7R

Rated Voltage	Chip size													
	0603		0805		1206		1210		1808		1812		2220	
	COG/NPO	X7R	COG/NPO	X7R	COG/NPO	X7R	COG/NPO	X7R	COG/NPO	X7R	COG/NPO	X7R	COG/NPO	X7R
Min Cap	-	100pF	4.7pF	100pF	10pF	100pF	22pF	100pF	22pF	100pF	47pF	150pF	68pF	220pF
10V	-	100nF	1.8nF	220nF	3.9nF	820nF	8.2nF	1.2µF	8.2nF	1.2µF	15nF	2.2µF	47nF	4.7µF
16V	-	100nF	1.8nF	220nF	3.9nF	820nF	8.2nF	1.2µF	8.2nF	1.2µF	15nF	2.2µF	47nF	4.7µF
25V	-	47nF	1.8nF	220nF	3.9nF	820nF	8.2nF	1.2µF	8.2nF	1.2µF	15nF	2.2µF	47nF	4.7µF
50V	-	15nF	1.8nF	100nF	3.9nF	270nF	8.2nF	680nF	8.2nF	560nF	15nF	1.5µF	47nF	2.2µF
100V	-	8.2nF	1.5nF	33nF	3.3nF	100nF	5.6nF	270nF	6.8nF	180nF	12nF	560nF	39nF	1.0µF
200V	-	1.2nF	820pF	6.8nF	1.8nF	27nF	3.9nF	68nF	3.9nF	47nF	10nF	82nF	22nF	120nF
250V	-	820pF	470pF	3.9nF	1.0nF	15nF	2.2nF	47nF	2.2nF	27nF	5.6nF	56nF	12nF	82nF
500V	-	270pF	220pF	1.5nF	820pF	3.9nF	1.5nF	12nF	1.8nF	12nF	4.7nF	18nF	10nF	68nF
630V	-	-	68pF	-	330pF	-	820pF	-	820pF	-	2.7nF	-	6.8nF	-

Note: Other capacitance values may become available, please contact the Sales Office if you need values other than those shown in the above table. For dimensions and soldering information, please go to our website www.knowlescapacitors.com

Ordering information - Novacap Brand - High Temperature HiT range

1206	RE	331	J	501	N	H	T
Case size	Dielectric	Capacitance in picofarads (pF)	Capacitance tolerance	Voltage	Termination	Screening	Packaging
0603 0805 1206 1210 1808 1812 2220	RD = COG/NPO (200°C) RE = X7R (200°C)	First and Second digits are significant figures of capacitance code. The fourth digit is number of 0's following. Example : 103 = 10000pF R = decimal	COG/NPO F = ±1% G = ±2% J = ±5% K = ±10%	X7R J = ±5% K = ±10% M = ±20%	100 = 10V 160 = 16V 250 = 25V 500 = 50V 101 = 100V 201 = 200V 251 = 250V 501 = 500V 631 = 630V	N = Nickel barrier with 100% matte tin plating. RoHS compliant. Lead free.	H = High Temp Screening - if required T = 178mm (7") reel 330mm (13") reel None = Bulk pack - tubs

Ordering information - Syfer Brand - High Temperature HiT range

1206	J	1K0	0103	M	X	T	H20
Chip size	Termination	Voltage	Capacitance in picofarads (pF)	Capacitance tolerance	Dielectric	Packaging	Suffix Code
0603 0805 1206 1210 1808 1812 2220	J = Nickel barrier with 100% matte tin plating. RoHS compliant. Lead free.	010 = 10V 016 = 16V 025 = 25V 050 = 50V 063 = 63V 100 = 100V 200 = 200V 250 = 250V 500 = 500V 630 = 630V	≥1.0pF & <10pF Insert a P for the decimal point as the second character. e.g., 8P20 = 8.2pF ≥10pF First digit is 0. Second and third digits are significant figures of capacitance code. The fourth digit is the number of zeros following. e.g., 0101 = 100pF	COG/NPO F = ±1% G = ±2% J = ±5% K = ±10%	X7R J = ±5% K = ±10% M = ±20%	G = COG/NPO (BME) X = X7R	T = 178mm (7") reel R = 330mm (13") reel B = Bulk pack - tubs