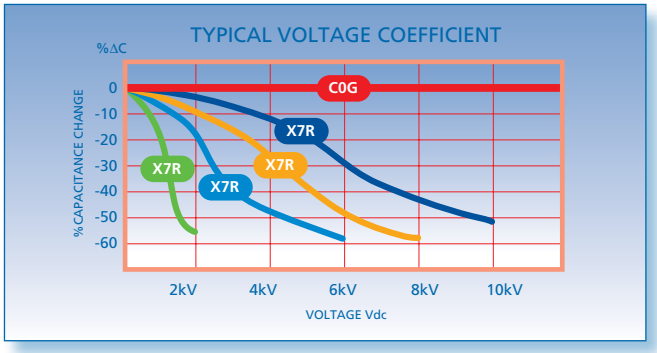
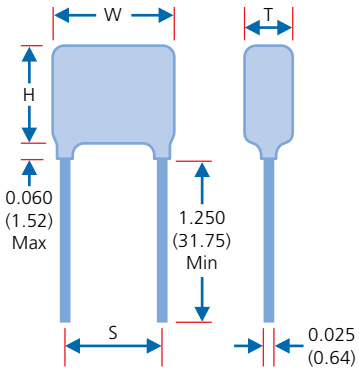
Radial Leaded Capacitors available in C0G and X7R characteristics with special testing for long term reliability. The conformal coating and lead mounting style provide a rugged configuration for optimum performance. Units may be tested to MIL-PRF-49467 and/or MIL-PRF-39014 and find application for High Reliability use such as power supplies, voltage multiplier circuits, aerospace, airborne and military use for radar. They are also offered without the conformal coating for less harsh environmental applications, and as RoHS compliant parts upon request.

- For dielectric characteristics see pages 4 & 6.
- For capacitance tolerances available see page 15.
- For ordering information see page 26.



Dimensions - inches/mm

Lead Style	LE with conformal coating - LO without coating						
Size	1515	2520	3530	4540	5550	6560	7565
Wmax inches: mm:	0.250 6.35	0.400 10.20	0.500 12.70	0.600 15.20	0.700 17.80	0.800 20.30	0.900 22.80
Hmax inches: mm:	0.250 6.35	0.350 8.89	0.450 11.40	0.550 14.0	0.650 16.50	0.750 19.0	0.850 21.60
Tmax inches: mm:	0.200 5.08	0.250 6.35	0.350 8.89	0.400 10.20	0.400 10.20	0.400 10.20	0.400 10.20
S inches ±0.02: mm ±0.51:	0.170 4.32	0.280 7.10	0.380 9.65	0.480 12.20	0.580 14.70	0.680 17.30	0.780 19.80



Capacitance and Voltage Selection

Size	1515		2520		3530		4540		5550		6560		7565	
Min cap.	3R0	151	390	102	390	102	390	102	390	102	560	222	101	222
Dielectric	C0G	X7R	C0G	X7R	C0G	X7R	C0G	X7R	C0G	X7R	C0G	X7R	C0G	X7R
500V	682	823	183	274	473	684	823	155	124	185	224	275	274	395
600V	682	563	183	184	393	474	823	824	124	155	184	225	274	275
800V	472	333	123	124	333	334	683	684	104	125	154	185	184	225
1kV	392	183	123	683	273	184	563	474	823	684	124	105	184	125
2kV	122	392	472	153	153	473	273	104	473	184	683	224	823	334
3kV	561	152	222	562	682	223	183	472	273	683	393	104	473	154
4kV	•	•	102	272	272	123	682	223	103	393	153	563	223	823
5kV	•	•	561	182	182	822	472	153	682	273	103	393	123	473
6kV	•	•	•	•	152	562	332	103	472	183	822	273	822	333
7kV	•	•	•	•	821	392	182	682	272	123	392	183	472	273
8kV	•	•	•	•	•	272	122	562	182	103	272	153	392	183
9kV	•	•	•	•	•	•	821	392	122	682	222	123	272	153
10kV	•	•	•	•	•	•	681	332	122	562	182	822	222	123

Note: Maximum capacitance values are shown above as 3 digit code: 2 significant figures followed by the no. of zeros e.g. 183 = 18,000pF. R denotes decimal e.g. 2R7 = 2.7pF.

How to Order - Radial Lead - Commercial & High Rel

0805	B	123	K	501	LE	H	A	R
SIZE See charts	**DIELECTRIC** N = C0G B = X7R RN = C0G RoHS 2013 ≤ 200V RB = X7R RoHS 2013 ≤ 200V S = X8R not RoHS compliant	**CAPACITANCE** Value in Picofarads. Two significant figures, followed by number of zeros: 123 = 12,000pF	**TOLERANCE** F = ±1%* G = ±2%* J = ± 5% K = ± 10% M = ± 20% *C0G parts only	**VOLTAGE-VDCW** Two significant figures, followed by number of zeros: 501 = 500V	**LEAD STYLES** LE, LB, LD, LR, LQ* = Yellow conformal coated LO = without any coating * Product & Case size dependant	**HIGH RELIABILITY** Specify testing - see page 27	**PACKING** No suffix = Bulk A = Ammo pack 2K/pack T = Tape & Reel 4K/Reel	**RoHS** R = RoHS Compliant

How to Order - Radial Lead - High Temperature

2520	E	563	K	501	LG	H	W	R
SIZE See charts	**DIELECTRIC** D = 200°C C0G E = 200°C Class II	**CAPACITANCE** Value in Picofarads. Two significant figures, followed by number of zeros: 563 = 56,000pF	**TOLERANCE** F = ±1%* G = ±2%* J = ± 5% K = ± 10% M = ± 20% *C0G parts only	**VOLTAGE-VDCW** Two significant figures, followed by number of zeros: 501 = 500V	**LEAD STYLES** LC = Encapsulated LG = Black Epoxy Coated LO = without any coating	**HIGH TEMP SCREENING** Novacap High Temperature screening procedure	**PACKING** No suffix = Bulk W = Waffle pack	**RoHS** R = RoHS Compliant Only available on ≥250V

High Reliability Testing

Our High Rel products are designed for optimum reliability and are burned in at elevated voltage and temperature levels. They are 100% electrically inspected to ascertain conformance to a strict performance criteria.

Applications for High Reliability products include medical implanted devices, aerospace, airborne, various military applications, and consumer uses requiring safety margins not attainable with conventional product.

We have the ability to test surface mount and leaded capacitors to High Reliability standards as detailed below, or to customer SCD.

Military performance specifications are designed and written for the voltage/ capacitance ratings of the individual product slash numbers associated with the specification.

Some of the requirements of the military document may not apply to the NOVACAP High Reliability product. The following details the intent of the individual military specifications available for test and the deviations that may apply.

Product voltage ratings outside of the intended military specification will follow the NOVACAP voltage test potential outlined.

Contact the sales office with any requirements or deviations that are not covered here.

Environmental Testing

We also have the capability to perform all the Environmental Group B, Group C, and Qualification testing to the referenced military specifications.
Testing abilities include the following:

- Nondestructive internal examination
- Destructive physical analysis
- Radiographic inspection
- Terminal strength
- Resistance to soldering heat
- Voltage-temperature limits
- Temperature coefficient
- Moisture resistance
- Humidity, steady state, low voltage
- Vibration
- Resistance to solvents
- Life
- Thermal shock and immersion
- Low temperature storage
- Barometric pressure
- Shock, specified pulse
- Mechanical shock
- Constant acceleration
- Wire bond evaluation
- Partial discharge (corona)
- 200°C Voltage Conditioning

Military Performance Specifications

MIL-PRF-55681 (GROUP A)

General purpose military high reliability specification for surface mount sizes 0805 through 2225 in 50V and 100V.

- VOLTAGE CONDITIONING
- 100 HRS, 2X VDCW, 125°C
- DWV, IR, 125°C IR, CAP, DF TEST
- VISUAL & MECH. INSPECTION (AQL SAMPLE PLAN)
- SOLDERABILITY, SAMPLE 13(0)
- 8% PDA MAXIMUM

MIL-PRF-123 (GROUP A)

The specification affords an increased reliability level over MIL-PRF-55681 for space, missile and other high reliability applications such as medical implantable or life support equipment. The specification covers surface mount sizes 0805 through 2225 in 50V rating and various radial / axial leaded products in 50V, 100V, and 200V ratings.

- THERMAL SHOCK, 20 CYCLES
- VOLTAGE CONDITIONING168/264 HRS, 2X VDCW, 125°C
- DWV, IR, 125°C IR, CAP, DF TEST
- VISUAL & MECH. INSPECTION SAMPLE 20(0)
- DPA(1)
- PDA, 3% (0.1%), 5% (0.2%) MAX(2)

MIL-PRF-39014 (GROUP A)

The specification covers general military purpose radial / axial leaded and encapsulated product in 50V, 100V, and 200V ratings.

- THERMAL SHOCK, 5 CYCLES
- VOLTAGE CONDITIONING 96 HRS, 2X VDCW, 125°C
- DWV, IR, 125°C IR, CAP, DF TEST
- VISUAL & MECH. INSPECTION (AQL SAMPLE PLAN)
- SOLDERABILITY, SAMPLE 13(0)
- 8% PDA MAXIMUM

MIL-PRF-49467 (GROUP A)

General purpose military high reliability specification for radial leaded epoxy coated. The specification covers sizes 1515 through 13060 with 600V, 1000V, 2000V, 3000V, 4000V, and 5000V ratings.

- THERMAL SHOCK, 5 CYCLES
- VOLTAGE CONDITIONING 96 HRS, RATED VDCW, 125°C
- PARTIAL DISCHARGE (OPTION) (3)
- DWV, IR, 125°C IR, CAP, DF TEST
- VISUAL & MECH. INSPECTION SAMPLE 13(0)
- SOLDERABILITY, SAMPLE 5(0)
- 10% PDA MAXIMUM

MIL-PRF-49470 (DSCC 87106) (GROUP A)

General purpose military high reliability specification for stacked and leaded capacitors for switch mode power supplies. The specification covers sizes 2225 through 120200 in 50V, 100V, 200V and 500V ratings.

- THERMAL SHOCK, 5 CYCLES
- VOLTAGE CONDITIONING 96 HRS, 2X VDCW(4), 125°C
- DWV, IR, 125°C IR, CAP, DF TEST
- VISUAL & MECH. INSPECTION SAMPLE 13(0)
- SOLDERABILITY, SAMPLE 5(0)
- 10% PDA MAXIMUM

MIL-PRF-38534

Specification for Hybrid Microcircuits with a section for Element Evaluation on passive components.

There are two classification levels of reliability. Class H is for a standard military quality level. Class K is for the highest reliability level intended for space application.

Novacap will perform a 100-hour burn-in on all Class K products. Novacap assumes Class K Subgroup 3 samples will be unmounted and Subgroup 4 (wirebond) shall not apply unless otherwise stated.

NOVACAP TEST VOLTAGE (VDC)

This test potential shall be used on all High Reliability Testing unless otherwise specified.

WVDC	DWV	V/C*
<200	2.5X Rated	2.0X Rated
250	500V	400V
300	500V	400V
400	600V	500V
500	750V	600V
600	750V	600V
>700	1.2X Rated	1.0X Rated

*V/C Is Voltage Conditioning.

(1) MIL-PRF-123 DPA shall be per TABLE XIV AQL requirements unless otherwise specified.

(2) MIL-PRF-123 allowable PDA shall be 3% overall and 0.1% in the last 48 hours for capacitance/ voltage values listed in MIL-PRF-123, and be 5% overall and 0.2% in the last 48 hours for capacitance/voltage values beyond MIL-PRF-123.

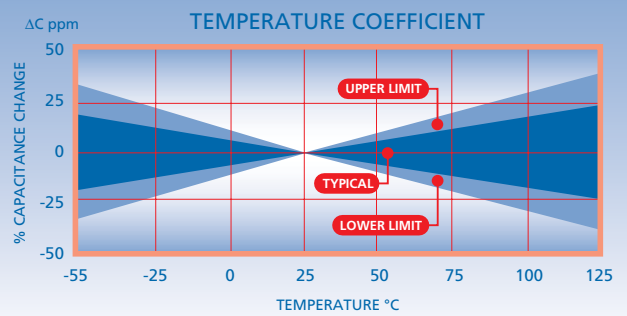
(3) MIL-PRF-49467 standard Group A is without Partial Discharge. Partial Discharge test is optional and must be specified.

(4) MIL-PRF-49470 (DSCC 87106) 500V rated product has Voltage Conditioning at 1.2X VDCW.

Dielectric Characteristics

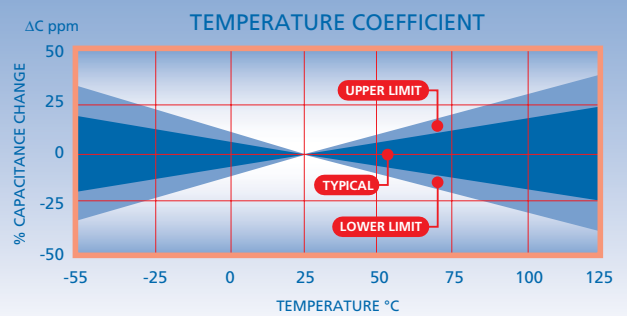
C0G/NP0 (N) Ultra Stable and RoHS 2013 (RN) type

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



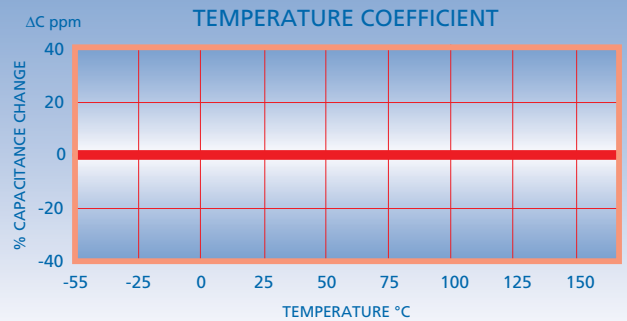
C0G/NP0 (M) Ultra Stable Non Magnetic

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



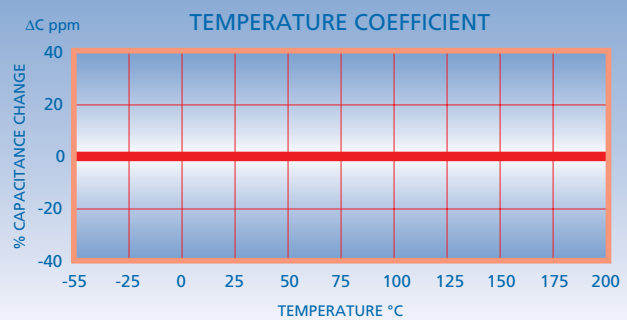
C0G/NP0 (F) Ultra Stable High Temperature (up to 160°C)

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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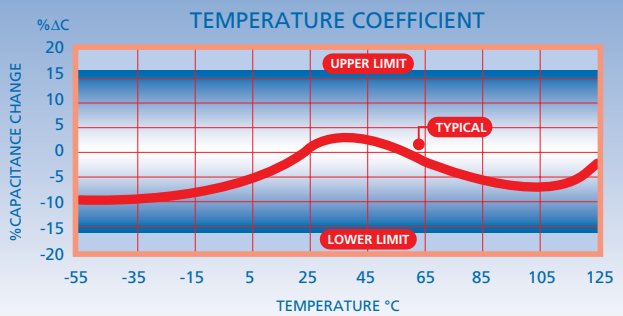
Dielectric Characteristics

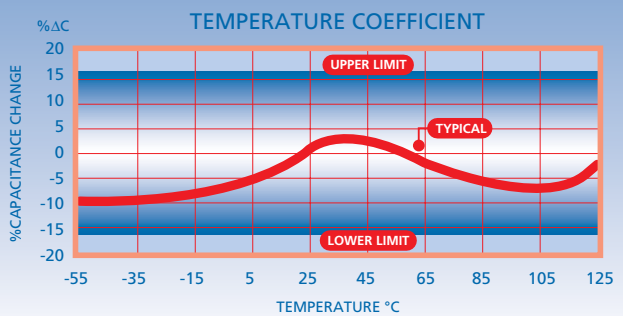
X7R (B) Stable and RoHS 2013 (RB) type

Operating temperature range:		-55°C to 125°C
Temperature coefficient :		±15% ΔC Max.
Dissipation factor	>25V rating: ≤25V rating:	2.5% max 3.5% max
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:		<2.0% per decade
Test parameters:		1KHz, 1.0 ±0.2 VRMS, 25°C



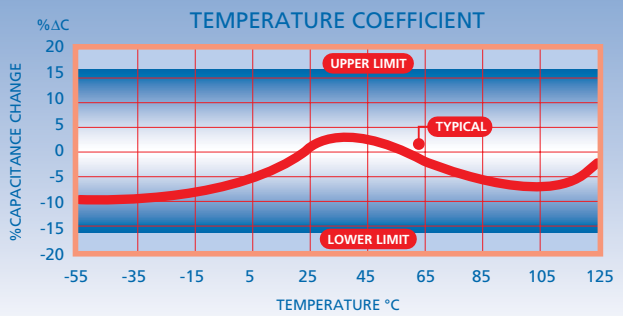
X7R (C) Stable Non Magnetic

Operating temperature range:		-55°C to 125°C
Temperature coefficient:		±15% ΔC Max.
Dissipation factor	>25V rating: ≤25V rating:	2.5% max 3.5% max
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:		<2.0% per decade
Test parameters:		1KHz, 1.0 ±0.2 VRMS, 25°C



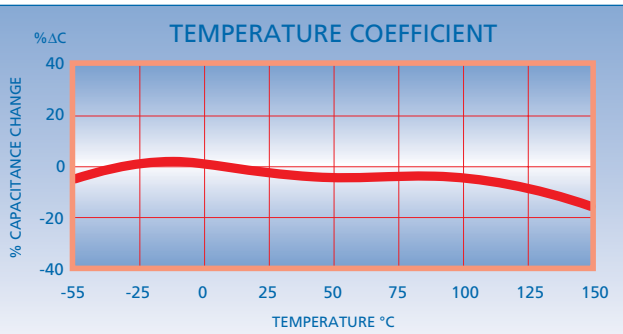
BX (X) Stable

Operating temperature range:		-55°C to 125°C
Temperature coefficient: Temp-voltage coefficient:		±15% ΔC Max. +15% -25% ΔC Max.
Dissipation factor	>25V rating: ≤25V rating:	2.5% max 3.5% max
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:		<2.0% per decade
Test parameters:		1KHz, 1.0 ±0.2 VRMS, 25°C



X8R (S) Stable

Operating temperature range:		-55°C to 150°C
Temp. coefficient ≤150°C:		±15% ΔC Max.
Dissipation factor	>25V rating: ≤25V rating:	2.5% max 3.5% max
Insulation resistance	@25°C: @150°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:		<2.0% per decade
Test parameters:		1KHz, 1.0 ±0.2 VRMS, 25°C



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