# Cased Radial Capacitors NPO

**ORDERING CODE** VK20 B A 101 J B R TR

- Style
- Temperature range (-55° + 125°)
- Dielectric (A = NPO)
- Capacitance according to EIA[1]
- Tolerance according to EIA
- Rated Voltage A = 50/63V B = 100V C = 200V
- Termination: R = RoHS compliant, blank = Tin/Lead alloy
- Denotes customer special requirements eg, packaging, marking, testing etc.

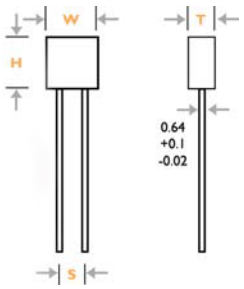
**Dimensions mm**

Case:
Plastic Case with Epoxy Resin Fill

Tolerances available
Standard
<10pF, C = ±0.25pF D = ±0.5pF
≥10pF, F = ±1% G = ±2% J = ±5%
K = ±10% M = ±20%

Other capacitance values, voltages and lead configurations are available

Lead Length:
Bulk - 31.75mm min
Taped & Reeled - 24mm min




[1]Capacitance values are in pF. The first two digits give the nominal value, the third digit the number of noughts e.g. 102 = 1000pF. For values below 10pF an R is substituted for a decimal point e.g. 2R2 = 2.2pF

| Style | | VK20 | | | VK21 | | VK30 | | |
|---|---|---|---|---|---|---|---|---|---|
| Max. Height H | | 5.08 | | | 5.08 | | 7.62 | | |
| Max. Width W | | 5.08 | | | 5.08 | | 7.62 | | |
| Max. Thickness T | | 2.54 | | | 2.54 | | 2.54 | | |
| Lead Spacing S ±0.38 | | 5.08 | | | 2.54 | | 5.08 | | |
| Rated Voltage V D.C. | | 50/63 | 100 | 200 | 100 | 200 | 50/63 | 100 | 200 |
| Cap. (pF) | EIA Code | Minimum and Maximum Capacitance values available. (Capacitance values to the E24 range also available). | | | | | | | |
| 1.0 | 1R0 | | | | | | | | |
| 1.2 | 1R2 | | | | | | | | |
| 1.5 | 1R5 | | | | | | | | |
| 1.8 | 1R8 | | | | | | | | |
| 2.2 | 2R2 | | | | | | | | |
| 2.7 | 2R7 | | | | | | | | |
| 3.3 | 3R3 | | | | | | | | |
| 3.9 | 3R9 | | | | | | | | |
| 4.7 | 4R7 | | | | | | | | |
| 5.6 | 5R6 | | | | | | | | |
| 6.8 | 6R8 | | | | | | | | |
| 8.2 | 8R2 | | | | | | | | |
| 10 | 100 | | | | | | | | |
| 12 | 120 | | | | | | | | |
| 15 | 150 | | | | | | | | |
| 18 | 180 | | | | | | | | |
| 22 | 220 | | | | | | | | |
| 27 | 270 | | | | | | | | |
| 33 | 330 | | | | | | | | |
| 39 | 390 | | | | | | | | |
| 47 | 470 | | | | | | | | |
| 56 | 560 | | | | | | | | |
| 68 | 680 | | | | | | | | |
| 82 | 820 | | | | | | | | |
| 100 | 101 | | | | | | | | |
| 120 | 121 | | | | | | | | |
| 150 | 151 | | | | | | | | |
| 180 | 181 | | | | | | | | |
| 220 | 221 | | | | | | | | |
| 270 | 271 | | | | | | | | |
| 330 | 331 | | | | | | | | |
| 390 | 391 | | | | | | | | |
| 470 | 471 | | | | | | | | |
| 560 | 561 | | | | | | | | |
| 680 | 681 | | | | | | | | |
| 820 | 821 | | | | | | | | |
| 1,000 | 102 | | | | | | | | |
| 1,200 | 122 | | | | | | | | |
| 1,500 | 152 | | | | | | | | |
| 1,800 | 182 | | | | | | | | |
| 2,200 | 222 | | | | | | | | |
| 2,700 | 272 | | | | | | | | |
| 3,300 | 332 | | | | | | | | |
| 3,900 | 392 | | | | | | | | |
| 4,700 | 472 | | | | | | | | |
| 5,600 | 562 | | | | | | | | |
| 6,800 | 682 | | | | | | | | |
| 8,200 | 822 | | | | | | | | |
| 10,000 | 103 | | | | | | | | |
| 12,000 | 123 | | | | | | | | |
| 15,000 | 153 | | | | | | | | |
| 18,000 | 183 | | | | | | | | |
| 22,000 | 223 | | | | | | | | |
| 27,000 | 273 | | | | | | | | |
| 33,000 | 333 | | | | | | | | |
| 39,000 | 393 | | | | | | | | |
| 47,000 | 473 | | | | | | | | |
| 56,000 | 563 | | | | | | | | |
| 68,000 | 683 | | | | | | | | |
| 82,000 | 823 | | | | | | | | |

Standard Range
Tolerance: All


**VK20**


**VK21**


**VK30**

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# Cased Radial Capacitors

# X7R

**ORDERING CODE** VK20 B Y 103 K B R TR

- Style
- Temperature range (-55° + 125°)
- Dielectric (Y = X7R X = BX)
- Capacitance according to EIA[1]
- Tolerance according to EIA
- Rated Voltage A = 50/63V B = 100V C = 200V
- Termination: R = RoHS compliant, blank = Tin/Lead alloy
- Denotes customer special requirements eg, packaging, marking, testing etc.

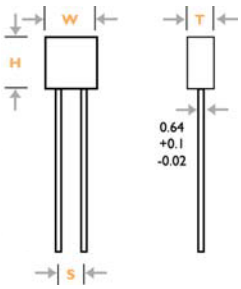
**Dimensions mm**

Case:
Plastic Case with Epoxy Resin Fill

Tolerances available
Standard
J = ±5% K = ±10% M = ±20%

Other capacitance values, voltages and lead configurations are available

Lead Length:
Bulk - 31.75mm min
Taped & Reeled - 24mm min




[1]Capacitance values are in pF. The first two digits give the nominal value, the third digit the number of noughts e.g. 103 = 10000pF.

| Style | | VK20 | | | VK21 | | | VK30 | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Max. Height H | | 5.08 | | | 5.08 | | | 7.62 | | |
| Max. Width W | | 5.08 | | | 5.08 | | | 7.62 | | |
| Max. Thickness T | | 2.54 | | | 2.54 | | | 2.54 | | |
| Lead Spacing S ±0.38 | | 5.08 | | | 2.54 | | | 5.08 | | |
| Rated Voltage V D.C. | | 50/63 | 100 | 200 | 50/63 | 100 | 200 | 50/63 | 100 | 200 |
| Cap. (pF) | EIA Code | Minimum and Maximum Capacitance values available. (Capacitance values to the E24 range also available). | | | | | | | | |
| 10 | 100 | | | | | | | | | |
| 12 | 120 | | | | | | | | | |
| 15 | 150 | | | | | | | | | |
| 18 | 180 | | | | | | | | | |
| 22 | 220 | | | | | | | | | |
| 27 | 270 | | | | | | | | | |
| 33 | 330 | | | | | | | | | |
| 39 | 390 | | | | | | | | | |
| 47 | 470 | | | | | | | | | |
| 56 | 560 | | | | | | | | | |
| 68 | 680 | | | | | | | | | |
| 82 | 820 | | | | | | | | | |
| 100 | 101 | | | | | | | | | |
| 120 | 121 | | | | | | | | | |
| 150 | 151 | | | | | | | | | |
| 180 | 181 | | | | | | | | | |
| 220 | 221 | | | | | | | | | |
| 270 | 271 | | | | | | | | | |
| 330 | 331 | | | | | | | | | |
| 390 | 391 | | | | | | | | | |
| 470 | 471 | | | | | | | | | |
| 560 | 561 | | | | | | | | | |
| 680 | 681 | | | | | | | | | |
| 820 | 821 | | | | | | | | | |
| 1,000 | 102 | | | | | | | | | |
| 1,200 | 122 | | | | | | | | | |
| 1,500 | 152 | | | | | | | | | |
| 1,800 | 182 | | | | | | | | | |
| 2,200 | 222 | | | | | | | | | |
| 2,700 | 272 | | | | | | | | | |
| 3,300 | 332 | | | | | | | | | |
| 3,900 | 392 | | | | | | | | | |
| 4,700 | 472 | | | | | | | | | |
| 5,600 | 562 | | | | | | | | | |
| 6,800 | 682 | | | | | | | | | |
| 8,200 | 822 | | | | | | | | | |
| 10,000 | 103 | | | | | | | | | |
| 12,000 | 123 | | | | | | | | | |
| 15,000 | 153 | | | | | | | | | |
| 18,000 | 183 | | | | | | | | | |
| 22,000 | 223 | | | | | | | | | |
| 27,000 | 273 | | | | | | | | | |
| 33,000 | 333 | | | | | | | | | |
| 39,000 | 393 | | | | | | | | | |
| 47,000 | 473 | | | | | | | | | |
| 56,000 | 563 | | | | | | | | | |
| 68,000 | 683 | | | | | | | | | |
| 82,000 | 823 | | | | | | | | | |
| 100,000 | 104 | | | | | | | | | |
| 120,000 | 124 | | | | | | | | | |
| 150,000 | 154 | | | | | | | | | |
| 180,000 | 184 | | | | | | | | | |
| 220,000 | 224 | | | | | | | | | |
| 270,000 | 274 | | | | | | | | | |
| 330,000 | 334 | | | | | | | | | |
| 470,000 | 474 | | | | | | | | | |
| 560,000 | 564 | | | | | | | | | |
| 680,000 | 684 | | | | | | | | | |
| 820,000 | 824 | | | | | | | | | |
| 1,000,000 | 105 | | | | | | | | | |

Standard Range
Tolerance: J K M

**VK20**

**VK21**

**VK30**

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# Cased Radial Capacitors MIL Range

**BX**

**ORDERING CODE** CK05 BX 103 K B R TR

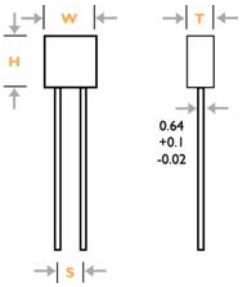
- Style
- Temperature voltage characteristics
- Capacitance according to EIA[1]
- Tolerance according to EIA
- Rated Voltage A = 50/63V B = 100V C = 200V
- Termination: R = RoHS compliant, blank = Tin/Lead alloy
- Denotes customer special requirements eg, packaging, marking, testing etc.

**Dimensions mm**

Tolerances available
Standard
K = ±10% M = ±20%

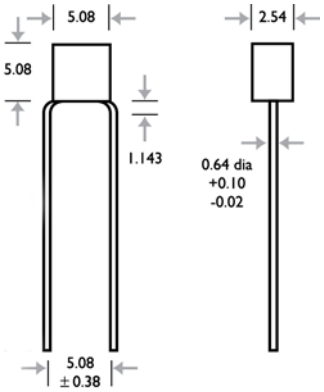
Case:
Plastic Case with Epoxy Resin Fill

Lead Length:
Bulk - 31.75mm min
Taped & Reeled - 24mm min




Dimensions

**VK20 : CK05**




| Style | | CK05 | | | CK06 | | |
|---|---|---|---|---|---|---|---|
| Max. Height H | | 5.08 | | | 7.62 | | |
| Max. Width W | | 5.08 | | | 7.62 | | |
| Max. Thickness T | | 2.54 | | | 2.54 | | |
| Lead Spacing S ±0.38 | | 5.08 | | | 5.08 | | |
| Rated Voltage V D.C. | | 50/63 | 100 | 200 | 50/63 | 100 | 200 |
| Cap. (pF) | EIA Code | Minimum and Maximum Capacitance values available. | | | | | |
| 10 | 100 | | | | | | |
| 12 | 120 | | | | | | |
| 15 | 150 | | | | | | |
| 18 | 180 | | | | | | |
| 22 | 220 | | | | | | |
| 27 | 270 | | | | | | |
| 33 | 330 | | | | | | |
| 39 | 390 | | | | | | |
| 47 | 470 | | | | | | |
| 56 | 560 | | | | | | |
| 68 | 680 | | | | | | |
| 82 | 820 | | | | | | |
| 100 | 101 | | | | | | |
| 120 | 121 | | | | | | |
| 150 | 151 | | | | | | |
| 180 | 181 | | | | | | |
| 220 | 221 | | | | | | |
| 270 | 271 | | | | | | |
| 330 | 331 | | | | | | |
| 390 | 391 | | | | | | |
| 470 | 471 | | | | | | |
| 560 | 561 | | | | | | |
| 680 | 681 | | | | | | |
| 820 | 821 | | | | | | |
| 1,000 | 102 | | | | | | |
| 1,200 | 122 | | | | | | |
| 1,500 | 152 | | | | | | |
| 1,800 | 182 | | | | | | |
| 2,200 | 222 | | | | | | |
| 2,700 | 272 | | | | | | |
| 3,300 | 332 | | | | | | |
| 3,900 | 392 | | | | | | |
| 4,700 | 472 | | | | | | |
| 5,600 | 562 | | | | | | |
| 6,800 | 682 | | | | | | |
| 8,200 | 822 | | | | | | |
| 10,000 | 103 | | | | | | |
| 12,000 | 123 | | | | | | |
| 15,000 | 153 | | | | | | |
| 18,000 | 183 | | | | | | |
| 22,000 | 223 | | | | | | |
| 27,000 | 273 | | | | | | |
| 33,000 | 333 | | | | | | |
| 39,000 | 393 | | | | | | |
| 47,000 | 473 | | | | | | |
| 56,000 | 563 | | | | | | |
| 68,000 | 683 | | | | | | |
| 82,000 | 823 | | | | | | |
| 100,000 | 104 | | | | | | |
| 120,000 | 124 | | | | | | |
| 150,000 | 154 | | | | | | |
| 180,000 | 184 | | | | | | |
| 220,000 | 224 | | | | | | |
| 270,000 | 274 | | | | | | |
| 330,000 | 334 | | | | | | |
| 470,000 | 474 | | | | | | |
| 560,000 | 564 | | | | | | |
| 680,000 | 684 | | | | | | |
| 820,000 | 824 | | | | | | |
| 1,000,000 | 105 | | | | | | |

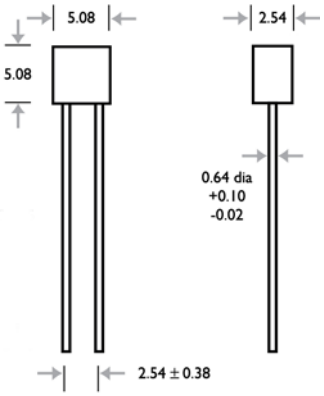
[1]Capacitance values are in pF. The first two digits give the nominal value, the third digit the number of noughts e.g. 103 = 10000pF.

MIL Range

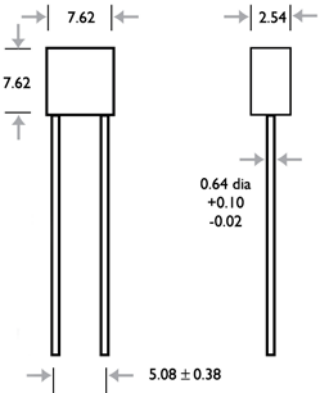
**CK05**

**CK06**

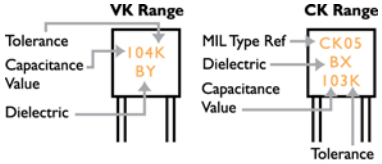
**VK21**



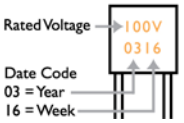

**VK30 : CK06**




**Marking** —Side 1




**Marking** —Side 2

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# Monolithic Ceramic Capacitors Dielectric Characteristics and Classification

## Dielectric Characteristics

| Dielectric | COG/NPO | X7R | BX |
|---|---|---|---|
| Dielectric Code | BA | BY | BX |
| Capacitance Range | 1pF to 56nF | 10pF to 1µF | 10pF to 1µF |
| Tolerance | <10pF ±0.25pF, ±0.5pF<br>≥10pF, ±1%, ±2%,<br>±5%, ±10%, ±20% | ±5%, ±10%, ±20% | ±5%, ±10%, ±20% |
| Rated Temperature Range | -55°C to 125°C | -55°C to 125°C | -55°C to 125°C |
| Temperature Characteristics at Rated Temperature Range | ≥50pF : 0±30 ppm/°C | ±20% at 0V test voltage<br>+20% -30% at rated voltage | ±15% at 0V test voltage<br>+15% -25% at rated voltage |
| Rated Voltage | 50V to 500V | 50V to 500V | 50V to 200V |
| Dissipation Factor (Tan δ ) | ≥50pF : ≤15x$10^{-4}$<br><50pF : ≤1.5 (150/C+7) x $10^{-4}$ | ≤25 x $10^{-3}$ | ≤25 x $10^{-3}$ |
| Insulation Resistance at Rated Voltage | At 25°C : $10_5$MΩ or 1000ΩF<br>At 125°C : $10_4$MΩ or 100ΩF } whichever is less | | |
| Environmental Classification (IEC 68) | 55/125/56 | 55/125/56 | 55/125/56 |
| Environmental Frequency for Capacitance & Tan δ | ≤1000pF : 1MHz @ 1Vrms<br>>1000pF ; 1KHz @ 1Vrms | <100pF : 100KHz @ 1Vrms<br>≥100pF ; 1KHz @ 1Vrms | 1KHz @ 1Vrms |
| Proof Voltage | 2.5 x rated voltage/5sec. 50m A max. | | |
| Solderability | MIL-STD 202 Method 208 and BS 2011, Test T (Solder Bath and Solder Globule Methods) | | |

## Dielectric Classification

| | | | |
|---|---|---|---|
| Classification | EIA | COG/NPO | X7R |
| | MIL | BP | BX |
| Dielectric Class<br>( ε= Dielectric Constant | | CLASS 1 (ε<500) | CLASS 2 (ε<500) |
| General Performance | | • Almost linear capacitance/temperature function<br>• No voltage dependency of capacitance and loss angle<br>• No ageing<br>• High insulation resistance<br>• Very small dielectric loss<br>• High dielectric strength<br>• Normal capacitance tolerance ±1% to ±10% | • Non-linear capacitance/temperature function<br>• Slight ageing of capacitance<br>• High insulation resistance<br>• Extremely high capacitance value per unit of volume<br>• Normal capacitance tolerance ±5% to ±20% |
| Typical Applications | | • Frequency control capacitors in oscillator circuits & filters<br>• Temperature compensation<br>• Coupling and by-pass in HF circuits | • Coupling<br>• Decoupling<br>• D.C. blocking<br>• Spark suppression |