

SEMTECH INDUSTRIAL HIGH VOLTAGE CAPACITORS MONOLITHIC CERAMIC TYPE

Semtech's Industrial Capacitors employ a new body design for cost efficient, volume manufacturing. This capacitor body design also expands our voltage capability to 10 KV and our capacitance range to .47 μ F. If your requirement exceeds our single device ratings, Semtech can build a custom capacitor assembly to reach the values you need.

- X7R AND NPO DIELECTRICS • 100 pF TO .47 μ F CAPACITANCE RANGE • 1 TO 10 KV VOLTAGE RANGE
- 14 CHIP SIZES

CAPABILITY MATRIX

| Size | Bias Voltage (Note 2) | Dielectric Type | Maximum Capacitance—EIA Code (Note 1) | | | | | | | | | | |
|------|-----------------------|-----------------|---------------------------------------|------|------|------|------|------|------|------|------|-------|--|
| | | | 1 KV | 2 KV | 3 KV | 4 KV | 5 KV | 6 KV | 7 KV | 8 KV | 9 KV | 10 KV | |
| 1515 | — VDCW 0 | NPO | 102 | 561 | 271 | 181 | 121 | | | | | | |
| | | X7R | 562 | 222 | 102 | 471 | 271 | | | | | | |
| | | X7R | 123 | 472 | 222 | 821 | 561 | | | | | | |
| 2020 | — VDCW 0 | NPO | 182 | 122 | 561 | 331 | 221 | 181 | | | | | |
| | | X7R | 103 | 472 | 182 | 681 | 471 | 271 | | | | | |
| | | X7R | 223 | 103 | 392 | 152 | 102 | 561 | | | | | |
| 2520 | — VDCW 0 | NPO | 222 | 152 | 681 | 391 | 271 | 221 | 101 | | | | |
| | | X7R | 153 | 682 | 222 | 821 | 561 | 331 | 181 | | | | |
| | | X7R | 333 | 123 | 472 | 182 | 122 | 681 | 391 | | | | |
| 3333 | — VDCW 0 | NPO | 682 | 472 | 222 | 122 | 821 | 561 | 271 | | | | |
| | | X7R | 473 | 153 | 562 | 272 | 182 | 102 | 561 | | | | |
| | | X7R | 104 | 333 | 123 | 562 | 392 | 222 | 122 | | | | |
| 3530 | — VDCW 0 | NPO | 562 | 392 | 182 | 102 | 681 | 471 | 221 | | | | |
| | | X7R | 393 | 153 | 562 | 272 | 182 | 102 | 561 | | | | |
| | | X7R | 823 | 333 | 123 | 562 | 392 | 222 | 122 | | | | |
| 4020 | — VDCW 0 | NPO | 152 | 102 | 821 | 681 | 391 | 331 | 271 | 181 | 121 | 101 | |
| | | X7R | 123 | 562 | 272 | 122 | 821 | 681 | 471 | 391 | 391 | 331 | |
| | | X7R | 223 | 123 | 562 | 272 | 182 | 152 | 102 | 821 | 681 | 561 | |
| 4040 | — VDCW 0 | NPO | 103 | 682 | 332 | 222 | 122 | 102 | 391 | 331 | | | |
| | | X7R | 563 | 273 | 103 | 392 | 272 | 182 | 471 | 471 | | | |
| | | X7R | 124 | 563 | 223 | 822 | 562 | 392 | 182 | 102 | | | |
| 4540 | — VDCW 0 | NPO | 123 | 822 | 332 | 222 | 152 | 122 | 471 | 331 | | | |
| | | X7R | 683 | 333 | 123 | 472 | 332 | 222 | 102 | 561 | | | |
| | | X7R | 154 | 683 | 273 | 103 | 682 | 472 | 222 | 122 | | | |
| 5040 | — VDCW 0 | NPO | 182 | 122 | 102 | 681 | 471 | 391 | 271 | 221 | 151 | 121 | |
| | | X7R | 153 | 682 | 332 | 152 | 102 | 821 | 561 | 471 | 391 | 391 | |
| | | X7R | 273 | 153 | 682 | 332 | 222 | 182 | 122 | 102 | 821 | 681 | |
| 5440 | — VDCW 0 | NPO | 153 | 103 | 472 | 272 | 182 | 122 | 561 | 391 | | | |
| | | X7R | 104 | 333 | 153 | 562 | 392 | 272 | 122 | 681 | | | |
| | | X7R | 224 | 683 | 333 | 123 | 822 | 562 | 272 | 152 | | | |
| 5550 | — VDCW 0 | NPO | 183 | 123 | 562 | 332 | 222 | 152 | 681 | 561 | | | |
| | | X7R | 124 | 393 | 183 | 682 | 472 | 332 | 152 | 821 | | | |
| | | X7R | 274 | 823 | 393 | 153 | 103 | 682 | 332 | 182 | | | |
| 6560 | — VDCW 0 | NPO | 273 | 183 | 822 | 562 | 332 | 272 | 122 | 821 | | | |
| | | X7R | 184 | 563 | 273 | 103 | 682 | 472 | 272 | 122 | | | |
| | | X7R | 394 | 124 | 563 | 223 | 153 | 103 | 562 | 272 | | | |
| 6666 | — VDCW 0 | NPO | 123 | 682 | 562 | 472 | 272 | 222 | 152 | 122 | 102 | 681 | |
| | | X7R | 823 | 473 | 183 | 822 | 682 | 472 | 332 | 272 | 182 | 122 | |
| | | X7R | 154 | 104 | 393 | 183 | 153 | 103 | 682 | 562 | 392 | 272 | |
| 7565 | — VDCW 0 | NPO | 333 | 223 | 103 | 682 | 392 | 332 | 152 | 102 | | | |
| | | X7R | 224 | 683 | 333 | 123 | 822 | 562 | 332 | 152 | | | |
| | | X7R | 474 | 154 | 683 | 273 | 183 | 123 | 682 | 332 | | | |

- NOTES: 1. EIA Capacitance Code: Value in Picofarads, two significant figures followed by number of zeros: 562 = 5600 pF, 273 = 27000 pF (.027 mfd).
2. • Class I Dielectric (NPO) has zero voltage coefficient. Values shown are at 0 volt bias, or at working volts (VDCW).
- Class II Dielectric (X7R) has voltage coefficient, and values derate at VDCW by up to 50% of value at 0 volt bias. Capacitance @ VDCW is function of design of unit and may vary.



INDUSTRIAL CAPACITOR DC VOLTAGE COEFFICIENTS



GENERAL SPECIFICATIONS

- OPERATING TEMPERATURE RANGE
-55°C to 125°C
- TEMPERATURE COEFFICIENT
NPO: ± 30 ppm/ $^{\circ}$ C
X7R: $\pm 15\%$ Δ C Max.
- DISSIPATION FACTOR
NPO: 0.1% Max, 0.02% typical
X7R: 2.5% Max, 1.5% typical
- INSULATION RESISTANCE
@ 25°C, 1.0 KV: >100G Ω or 1000 Ω F, whichever is less
@ 125°C, 1.0 KV: >10G Ω or 100 Ω F, whichever is less
- DIELECTRIC WITHSTANDING VOLTAGE
1.2 \times VDCW Min, 50 m-amp Max, 5 seconds
- AGING RATE
NPO: 0% per decade hour
X7R: <2.0% per decade hour
- TEST PARAMETERS
1 KHz, 1.0 VRMS \pm 0.2 VRMS, 25°C
0 Volts

SEMTECH INDUSTRIAL HIGH VOLTAGE CAPACITORS MONOLITHIC CERAMIC TYPE (cont.)

CHIP DIMENSIONS

| Size | (Nom.) Len. In. (mm) | (Nom.) Wid. In. (mm) | T (Max) In. (mm) |
|------|-------------------------|-------------------------|---------------------|
| 1515 | .150±.015 (3.81±.38) | .150±.015 (3.81±.38) | .120 (3.05) |
| 2020 | .200±.020 (5.08±.51) | .200±.020 (5.08±.51) | .120 (3.05) |
| 2520 | .230±.023 (5.84±.58) | .190±.019 (4.82±.48) | .120 (3.05) |
| 3333 | .330±.033 (8.38±.84) | .330±.033 (8.38±.84) | .150 (3.81) |
| 3530 | .350±.035 (8.89±.89) | .300±.030 (7.62±.76) | .150 (3.81) |
| 4020 | .400±.040 (10.2±1.0) | .200±.020 (5.08±.51) | .150 (3.81) |
| 4040 | .400±.040 (10.2±1.0) | .400±.040 (10.2±1.0) | .150 (3.81) |
| 4540 | .450±.045 (11.4±1.1) | .400±.040 (10.2±1.0) | .150 (3.81) |
| 5040 | .460±.046 (11.7±1.2) | .380±.038 (9.65±.97) | .150 (3.81) |
| 5440 | .540±.054 (13.7±1.4) | .400±.040 (10.2±1.0) | .150 (3.81) |
| 5550 | .550±.055 (14.0±1.4) | .500±.050 (12.7±1.3) | .150 (3.81) |
| 6560 | .650±.065 (16.5±1.7) | .600±.060 (15.2±1.5) | .175 (4.45) |
| 6666 | .660±.066 (16.8±1.7) | .660±.066 (16.8±1.7) | .175 (4.45) |
| 7565 | .750±.075 (19.0±1.9) | .650±.065 (16.5±1.7) | .175 (4.45) |

ENCAPSULATED DIMENSIONS

| Size | Len. (Max) In. (mm) | Wid. (Max) In. (mm) | T (Max) In. (mm) | S In. (mm) |
|------|------------------------|------------------------|---------------------|-------------------------|
| 1515 | .300 (7.62) | .300 (7.62) | .220 (5.59) | .180±.03 (4.57±.46) |
| 2020 | .350 (8.89) | .350 (8.89) | .220 (5.59) | .230±.03 (5.84±.58) |
| 2520 | .380 (9.65) | .340 (8.64) | .220 (5.59) | .260±.03 (6.60±.66) |
| 3333 | .480 (12.2) | .480 (12.2) | .250 (6.35) | .360±.033 (9.14±.91) |
| 3530 | .500 (12.7) | .450 (11.4) | .250 (6.35) | .380±.035 (9.65±.97) |
| 4020 | .550 (13.97) | .350 (8.89) | .250 (6.35) | .430±.040 (10.9±1.1) |
| 4040 | .550 (13.97) | .550 (13.97) | .250 (6.35) | .430±.040 (10.9±1.1) |
| 4540 | .600 (15.24) | .550 (13.97) | .250 (6.35) | .480±.045 (12.2±1.2) |
| 5040 | .610 (15.49) | .530 (12.46) | .250 (6.35) | .490±.046 (12.4±1.2) |
| 5440 | .690 (17.53) | .550 (13.97) | .250 (6.35) | .570±.054 (14.5±1.4) |
| 5550 | .700 (17.78) | .650 (16.51) | .250 (6.35) | .580±.058 (14.7±1.5) |
| 6560 | .800 (20.32) | .750 (19.05) | .275 (6.99) | .680±.065 (17.3±1.7) |
| 6666 | .810 (20.57) | .810 (20.57) | .275 (6.99) | .690±.066 (17.5±1.8) |
| 7565 | .900 (22.86) | .800 (20.32) | .275 (6.99) | .780±.075 (19.8±2) |

ORDERING INSTRUCTIONS

| 2020 | A | X | 103 | K | 2 |
|----------------|---------------|---------------------|------------------------|-----------------------|----------------|
| PART SIZE CODE | FORM | DIELECTRIC MATERIAL | CAPACITANCE (EIA CODE) | CAPACITANCE TOLERANCE | VOLTAGE RATING |
| 1515 | CHIP | X=X7R | Last digit | J=5% | 1 KV |
| 2020 | A=Silver | | indicates number | K=10% | 2 KV |
| " | Termination | N=NPO | of zeroes | M=20% | " |
| " | D=Palladium / | | following the first | Z=+80%-20% | " |
| 7565 | Silver | | two digits. | | 10 KV |
| | Termination | | Ex. 103=10000 pF | | |
| | LEADED | | | | |
| | E=Epoxy | | | | |
| | Encapsulated | | | | |
| | L=Leaded Only | | | | |