

Solid-Electrolyte TANTALEX™ Capacitors, Military MIL-PRF-39003/03 Qualified, Style CSR23



FEATURES

- Hermetically sealed
- Metal cased
- Axial lead
- Weibull failure rates B, C, D
- Exponential failure rates M, P, R, S
- Tape and reel available per EIA-296 standard

PERFORMANCE CHARACTERISTICS

Operating Temperature: -55 °C to +125 °C
(above 85 °C, voltage derating is required)

Capacitance Range: 1.2 µF to 1000 µF

Capacitance Tolerance: ± 5 %, ± 10 %, ± 20 %

Voltage Rating: 6 V_{DC} to 50 V_{DC}

DESCRIPTION

Solid-electrolyte TANTALEX capacitors to military specification MIL-PRF-39003 - Exponential and Weibull Distribution: hermetically sealed, metal cased, axial leaded tubular capacitors manufactured as military style CSR23. These capacitors are furnished to the requirements of the military specification, including marking, testing and inspection.

In accordance with the specification, all capacitors are marked with the military part number (M39003/xx-xxxx) rather than the older style designation (CSRxxxxxxx) and should be ordered as such. All capacitors covered by MIL-PRF-39003 are now ordered with the military part number as illustrated in the Part Numbering System chart. Capacitors must not be ordered using the style number identification.

STYLE, MILITARY SPECIFICATION SHEET

Style CSR23, M39003/03 MIL-PRF-39003/3

MIL-PRF-39003 establishes failure rates (expressed in percent per 1000 h) based on exponential and Weibull distribution. Care must be exercised in ordering to insure the part number correctly identifies the desired failure rate level.

In addition, each order for military style CSR13, CSR21, CSR23 capacitors requiring government inspection must state whether inspection is to be at the destination or at the Vishay plant. Orders requiring source inspection cannot be shipped until this has been accomplished.

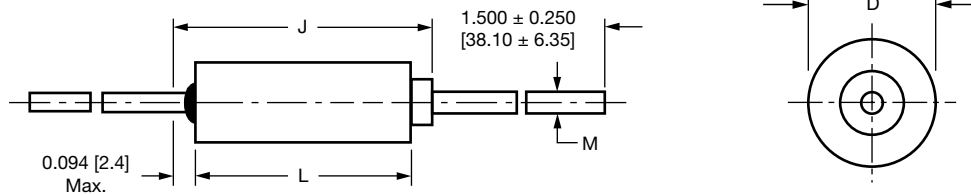
Style CS13 capacitors previously shown in MIL-C-26655 are directly replaced by style CSR13 and style CSR23 capacitors are extended capacitance range versions of military style CSR13.

For information on the performance characteristics of these capacitors, please refer to the latest issue of the military specification.

| ORDERING INFORMATION | | | | |
|---|--|---|---|---|
| M39003 | /03 | -2046 | A | /TR |
| BASIC DOCUMENT NUMBER | SLASH SHEET | DASH NUMBER | SURGE CURRENT OPTION LETTER | PACKAGING OPTION ⁽¹⁾ |
| Indicates the Basic Specification; in this case MIL-PRF-39003 | Indicates the Specification Sheet of the Basic Military Specification | Taken from Ratings table of the Specification Sheet | Blank = standard (no surge current) A = +25 °C, after Weibull B = -55 °C and +85 °C, after Weibull C = -55 °C and +85 °C, before Weibull D = +25 °C, after Weibull, high temperature solder E = -55 °C and +85 °C, after Weibull, high temperature solder F = -55 °C and +85 °C, before Weibull, high temperature solder H = high temperature solder only (no surge) | Blank = bulk /TR = tape and reel, full reel /HR = tape and reel, half reel /PR = tape and reel, partial reel /RR = tape and reel, option R, full reel /WR = tape and reel, option W, full reel |

Note

⁽¹⁾ See detailed packaging information following the Standard Ratings table

DIMENSIONS in inches [millimeters]


| CASE CODE | L ± 0.031 [0.79] | D + 0.016 [0.41] - 0.015 [0.38] | M ± 0.002 [0.05] | J (MAX.) |
|-----------|---------------------|---------------------------------------|---------------------|---------------|
| A | 0.286 [7.26] | 0.135 [3.43] | 0.020 [0.51] | 0.422 [10.72] |
| B | 0.474 [12.04] | 0.185 [4.70] | 0.020 [0.51] | 0.610 [15.49] |
| C | 0.686 [17.42] | 0.289 [7.34] | 0.025 [0.64] | 0.822 [20.88] |
| D | 0.786 [19.96] | 0.351 [8.92] | 0.025 [0.64] | 0.922 [23.42] |

Notes

- Capacitors of this series are supplied with shrink-fitted insulation sleeve. The insulation sleeve laps over the ends of the capacitor body, extending by 0.015" [0.38 mm] minimum beyond each end. Dimensions L and D include insulation sleeve additives. Dimension J is always larger than L and is not affected by insulation sleeve
- A minimum lead length of 1.0" [25.4 mm] for use with tape and reel automatic insertion equipment is available upon request

RATINGS AND CASE CODES

| µF | 6 V | 10 V | 15 V | 20 V | 35 V | 50 V |
|------|-----|------|------|------|------|------|
| 1.2 | | | | | | A |
| 1.5 | | | | | | A |
| 1.8 | | | | | A | |
| 2.7 | | | | A | | |
| 3.3 | | | | A | | |
| 3.9 | | | | A | | |
| 4.7 | | | A | | | |
| 5.6 | | | A | | | B |
| 6.8 | | A | | | | B |
| 8.2 | | A | | | B | |
| 10 | A | | | | B | |
| 12 | A | | | | | |
| 18 | | | | B | | |
| 22 | | | | B | | C |
| 27 | | | | B | | C |
| 33 | | | B | | C | D |
| 39 | | | B | | C | D |
| 47 | | B | | | C | |
| 56 | | B | | C | D | |
| 68 | | B | | C | D | |
| 82 | | B | | C | | |
| 100 | B | | | C | | |
| 120 | | | | C | | |
| 150 | | | C | D | | |
| 180 | | | C | D | | |
| 220 | | C | D | | | |
| 270 | | C | D | | | |
| 330 | C | | D | | | |
| 390 | C | D | | | | |
| 470 | C | D | | | | |
| 560 | | D | | | | |
| 680 | D | | | | | |
| 820 | D | | | | | |
| 1000 | D | | | | | |



| STANDARD RATINGS | | | | | | | | | | | | | |
|--|--------------|----------------------------|--|------|------|-------|------|------|-------|------------------------|--------|---------|-------------------|
| CAPACITANCE (μ F) | CASE CODE | CAP. TOL. (\pm %) | PART NO. M39003/03- FAILURE RATE LEVEL (%/1000 h) | | | | | | | MAX. DCL (μ A) AT | | | MAX. DF (%) AT |
| | | | M | P | R | S | B | C | D | +25 °C | +85 °C | +125 °C | -55 °C TO +125 °C |
| | | | 1.0 | 0.1 | 0.01 | 0.001 | 0.1 | 0.01 | 0.001 | | | | |
| 6 V_{DC} AT +85 °C, SURGE = 8 V; 4 V_{DC} AT +125 °C | | | | | | | | | | | | | |
| 10 | A | 10 | 0101 | 0201 | 0301 | 0401 | 2001 | 3001 | 4001 | 0.90 | 9.0 | 11.0 | 6 |
| 10 | A | 20 | 0102 | 0202 | 0302 | 0402 | 2002 | 3002 | 4002 | 0.90 | 9.0 | 11.0 | 6 |
| 12 | A | 10 | 0103 | 0203 | 0303 | 0403 | 2003 | 3003 | 4003 | 1.0 | 10.0 | 12.5 | 6 |
| 100 | B | 10 | 0104 | 0204 | 0304 | 0404 | 2004 | 3004 | 4004 | 6.0 | 60.0 | 75.0 | 8 |
| 100 | B | 20 | 0105 | 0205 | 0305 | 0405 | 2005 | 3005 | 4005 | 6.0 | 60.0 | 75.0 | 8 |
| 330 | C | 10 | 0106 | 0206 | 0306 | 0406 | 2006 | 3006 | 4006 | 15.0 | 150 | 188 | 8 |
| 330 | C | 20 | 0107 | 0207 | 0307 | 0407 | 2007 | 3007 | 4007 | 15.0 | 150 | 188 | 8 |
| 390 | C | 10 | 0108 | 0208 | 0308 | 0408 | 2008 | 3008 | 4008 | 15.0 | 150 | 188 | 10 |
| 470 | C | 10 | 0109 | 0209 | 0309 | 0409 | 2009 | 3009 | 4009 | 15.0 | 150 | 188 | 10 |
| 470 | C | 20 | 0110 | 0210 | 0310 | 0410 | 2010 | 3010 | 4010 | 15.0 | 150 | 188 | 10 |
| 680 | D | 10 | 0111 | 0211 | 0311 | 0411 | 2011 | 3011 | 4011 | 20.0 | 200 | 250 | 10 |
| 680 | D | 20 | 0112 | 0212 | 0312 | 0412 | 2012 | 3012 | 4012 | 20.0 | 200 | 250 | 10 |
| 820 | D | 10 | 0113 | 0213 | 0313 | 0413 | 2013 | 3013 | 4013 | 20.0 | 200 | 250 | 10 |
| 1000 | D | 10 | 0114 | 0214 | 0314 | 0414 | 2014 | 3014 | 4014 | 30.0 | 300 | 375 | 10 |
| 1000 | D | 20 | 0115 | 0215 | 0315 | 0415 | 2015 | 3015 | 4015 | 30.0 | 300 | 375 | 10 |
| 10 V_{DC} AT +85 °C, SURGE = 13 V; 7 V_{DC} AT +125 °C | | | | | | | | | | | | | |
| 6.8 | A | 10 | 0116 | 0216 | 0316 | 0416 | 2016 | 3016 | 4016 | 1.0 | 10.0 | 12.5 | 6 |
| 6.8 | A | 20 | 0117 | 0217 | 0317 | 0417 | 2017 | 3017 | 4017 | 1.0 | 10.0 | 12.5 | 6 |
| 8.2 | A | 10 | 0118 | 0218 | 0318 | 0418 | 2018 | 3018 | 4018 | 1.2 | 12.0 | 15.0 | 6 |
| 47 | B | 10 | 0119 | 0219 | 0319 | 0419 | 2019 | 3019 | 4019 | 5.0 | 50.0 | 63.0 | 6 |
| 47 | B | 20 | 0120 | 0220 | 0320 | 0420 | 2020 | 3020 | 4020 | 5.0 | 50.0 | 63.0 | 6 |
| 56 | B | 10 | 0121 | 0221 | 0321 | 0421 | 2021 | 3021 | 4021 | 6.0 | 60.0 | 75.0 | 6 |
| 68 | B | 10 | 0122 | 0222 | 0322 | 0422 | 2022 | 3022 | 4022 | 7.0 | 70.0 | 88.0 | 6 |
| 68 | B | 20 | 0123 | 0223 | 0323 | 0423 | 2023 | 3023 | 4023 | 7.0 | 70.0 | 88.0 | 6 |
| 82 | B | 10 | 0124 | 0224 | 0324 | 0424 | 2024 | 3024 | 4024 | 8.0 | 80.0 | 100 | 6 |
| 220 | C | 10 | 0125 | 0225 | 0325 | 0425 | 2025 | 3025 | 4025 | 15.0 | 150 | 188 | 8 |
| 220 | C | 20 | 0126 | 0226 | 0326 | 0426 | 2026 | 3026 | 4026 | 15.0 | 150 | 188 | 8 |
| 270 | C | 10 | 0127 | 0227 | 0327 | 0427 | 2027 | 3027 | 4027 | 15.0 | 150 | 188 | 8 |
| 390 | D | 10 | 0128 | 0228 | 0328 | 0428 | 2028 | 3028 | 4028 | 20.0 | 200 | 250 | 10 |
| 470 | D | 10 | 0129 | 0229 | 0329 | 0429 | 2029 | 3029 | 4029 | 20.0 | 200 | 250 | 10 |
| 470 | D | 20 | 0130 | 0230 | 0330 | 0430 | 2030 | 3030 | 4030 | 20.0 | 200 | 250 | 10 |
| 560 | D | 10 | 0131 | 0231 | 0331 | 0431 | 2031 | 3031 | 4031 | 30.0 | 300 | 375 | 10 |
| 15 V_{DC} AT +85 °C, SURGE = 20 V; 10 V_{DC} AT +125 °C | | | | | | | | | | | | | |
| 4.7 | A | 10 | 0132 | 0232 | 0332 | 0432 | 2032 | 3032 | 4032 | 1.0 | 10.0 | 12.5 | 4 |
| 4.7 | A | 20 | 0133 | 0233 | 0333 | 0433 | 2033 | 3033 | 4033 | 1.0 | 10.0 | 12.5 | 4 |
| 5.6 | A | 10 | 0134 | 0234 | 0334 | 0434 | 2034 | 3034 | 4034 | 1.3 | 13.0 | 16.5 | 4 |
| 33 | B | 10 | 0135 | 0235 | 0335 | 0435 | 2035 | 3035 | 4035 | 6.0 | 60.0 | 75.0 | 6 |
| 33 | B | 20 | 0136 | 0236 | 0336 | 0436 | 2036 | 3036 | 4036 | 6.0 | 60.0 | 75.0 | 6 |
| 39 | B | 10 | 0137 | 0237 | 0337 | 0437 | 2037 | 3037 | 4037 | 6.0 | 60.0 | 75.0 | 6 |
| 150 | C | 10 | 0138 | 0238 | 0338 | 0438 | 2038 | 3038 | 4038 | 15.0 | 150 | 188 | 8 |
| 150 | C | 20 | 0139 | 0239 | 0339 | 0439 | 2039 | 3039 | 4039 | 15.0 | 150 | 188 | 8 |
| 180 | C | 10 | 0140 | 0240 | 0340 | 0440 | 2040 | 3040 | 4040 | 15.0 | 150 | 188 | 8 |
| 220 | D | 10 | 0141 | 0241 | 0341 | 0441 | 2041 | 3041 | 4041 | 20.0 | 200 | 250 | 8 |
| 220 | D | 20 | 0142 | 0242 | 0342 | 0442 | 2042 | 3042 | 4042 | 20.0 | 200 | 250 | 8 |
| 270 | D | 10 | 0143 | 0243 | 0343 | 0443 | 2043 | 3043 | 4043 | 20.0 | 200 | 250 | 8 |
| 330 | D | 10 | 0144 | 0244 | 0344 | 0444 | 2044 | 3044 | 4044 | 20.0 | 200 | 250 | 8 |
| 330 | D | 20 | 0145 | 0245 | 0345 | 0445 | 2045 | 3045 | 4045 | 20.0 | 200 | 250 | 8 |



| STANDARD RATINGS | | | | | | | | | | | | | |
|--|--------------|----------------------------|--|------|------|-------|------|------|-------|------------------------|--------|---------|-------------------|
| CAPACITANCE (μ F) | CASE CODE | CAP. TOL. (\pm %) | PART NO. M39003/03- FAILURE RATE LEVEL (%/1000 h) | | | | | | | MAX. DCL (μ A) AT | | | MAX. DF (%) AT |
| | | | M | P | R | S | B | C | D | +25 °C | +85 °C | +125 °C | -55 °C TO +125 °C |
| | | | 1.0 | 0.1 | 0.01 | 0.001 | 0.1 | 0.01 | 0.001 | | | | |
| 20 V_{DC} AT +85 °C, SURGE = 26 V; 13 V_{DC} AT +125 °C | | | | | | | | | | | | | |
| 2.7 | A | 10 | 0146 | 0246 | 0346 | 0446 | 2046 | 3046 | 4046 | 0.80 | 8.0 | 10.0 | 4 |
| 3.3 | A | 10 | 0147 | 0247 | 0347 | 0447 | 2047 | 3047 | 4047 | 1.0 | 10.0 | 12.5 | 4 |
| 3.3 | A | 20 | 0148 | 0248 | 0348 | 0448 | 2048 | 3048 | 4048 | 1.0 | 10.0 | 12.5 | 4 |
| 3.9 | A | 10 | 0149 | 0249 | 0349 | 0449 | 2049 | 3049 | 4049 | 1.2 | 12.0 | 15.0 | 4 |
| 18 | B | 10 | 0150 | 0250 | 0350 | 0450 | 2050 | 3050 | 4050 | 4.0 | 40.0 | 50.0 | 6 |
| 22 | B | 10 | 0151 | 0251 | 0351 | 0451 | 2051 | 3051 | 4051 | 4.0 | 40.0 | 50.0 | 6 |
| 22 | B | 20 | 0152 | 0252 | 0352 | 0452 | 2052 | 3052 | 4052 | 4.0 | 40.0 | 50.0 | 6 |
| 27 | B | 10 | 0153 | 0253 | 0353 | 0453 | 2053 | 3053 | 4053 | 5.0 | 50.0 | 63.0 | 6 |
| 56 | C | 10 | 0154 | 0254 | 0354 | 0454 | 2054 | 3054 | 4054 | 9.0 | 90.0 | 110 | 6 |
| 68 | C | 10 | 0155 | 0255 | 0355 | 0455 | 2055 | 3055 | 4055 | 10.0 | 100 | 125 | 6 |
| 68 | C | 20 | 0156 | 0256 | 0356 | 0456 | 2056 | 3056 | 4056 | 10.0 | 100 | 125 | 6 |
| 82 | C | 10 | 0157 | 0257 | 0357 | 0457 | 2057 | 3057 | 4057 | 10.0 | 100 | 125 | 6 |
| 100 | C | 10 | 0158 | 0258 | 0358 | 0458 | 2058 | 3058 | 4058 | 15.0 | 150 | 188 | 6 |
| 100 | C | 20 | 0159 | 0259 | 0359 | 0459 | 2059 | 3059 | 4059 | 15.0 | 150 | 188 | 6 |
| 120 | C | 10 | 0160 | 0260 | 0360 | 0460 | 2060 | 3060 | 4060 | 15.0 | 150 | 188 | 6 |
| 150 | D | 10 | 0161 | 0261 | 0361 | 0461 | 2061 | 3061 | 4061 | 20.0 | 200 | 250 | 8 |
| 150 | D | 20 | 0162 | 0262 | 0362 | 0462 | 2062 | 3062 | 4062 | 20.0 | 200 | 250 | 8 |
| 180 | D | 10 | 0163 | 0263 | 0363 | 0463 | 2063 | 3063 | 4063 | 20.0 | 200 | 250 | 8 |
| 35 V_{DC} AT +85 °C, SURGE = 46 V; 23 V_{DC} AT +125 °C | | | | | | | | | | | | | |
| 1.8 | A | 10 | 0164 | 0264 | 0364 | 0464 | 2064 | 3064 | 4064 | 1.0 | 10.0 | 12.5 | 4 |
| 8.2 | B | 10 | 0165 | 0265 | 0365 | 0465 | 2065 | 3065 | 4065 | 3.5 | 35.0 | 44.0 | 6 |
| 10 | B | 10 | 0166 | 0266 | 0366 | 0466 | 2066 | 3066 | 4066 | 4.0 | 40.0 | 50.0 | 6 |
| 10 | B | 20 | 0167 | 0267 | 0367 | 0467 | 2067 | 3067 | 4067 | 4.0 | 40.0 | 50.0 | 6 |
| 33 | C | 10 | 0168 | 0268 | 0368 | 0468 | 2068 | 3068 | 4068 | 10.0 | 100 | 125 | 6 |
| 33 | C | 20 | 0169 | 0269 | 0369 | 0469 | 2069 | 3069 | 4069 | 10.0 | 100 | 125 | 6 |
| 39 | C | 10 | 0170 | 0270 | 0370 | 0470 | 2070 | 3070 | 4070 | 10.0 | 100 | 125 | 6 |
| 47 | C | 10 | 0171 | 0271 | 0371 | 0471 | 2071 | 3071 | 4071 | 10.0 | 100 | 125 | 6 |
| 47 | C | 20 | 0172 | 0272 | 0372 | 0472 | 2072 | 3072 | 4072 | 10.0 | 100 | 125 | 6 |
| 56 | D | 10 | 0173 | 0273 | 0373 | 0473 | 2073 | 3073 | 4073 | 15.0 | 150 | 188 | 6 |
| 68 | D | 10 | 0174 | 0274 | 0374 | 0474 | 2074 | 3074 | 4074 | 15.0 | 150 | 188 | 6 |
| 68 | D | 20 | 0175 | 0275 | 0375 | 0475 | 2075 | 3075 | 4075 | 15.0 | 150 | 188 | 6 |
| 50 V_{DC} AT +85 °C, SURGE = 65 V; 33 V_{DC} AT +125 °C | | | | | | | | | | | | | |
| 1.2 | A | 10 | 0176 | 0276 | 0376 | 0476 | 2076 | 3076 | 4076 | 0.9 | 9.0 | 11.0 | 4 |
| 1.5 | A | 10 | 0177 | 0277 | 0377 | 0477 | 2077 | 3077 | 4077 | 1.2 | 12.0 | 15.0 | 4 |
| 1.5 | A | 20 | 0178 | 0278 | 0378 | 0478 | 2078 | 3078 | 4078 | 1.2 | 12.0 | 15.0 | 4 |
| 5.6 | B | 10 | 0179 | 0279 | 0379 | 0479 | 2079 | 3079 | 4079 | 4.5 | 45.0 | 56.0 | 4 |
| 6.8 | B | 10 | 0180 | 0280 | 0380 | 0480 | 2080 | 3080 | 4080 | 4.5 | 45.0 | 56.0 | 6 |
| 6.8 | B | 20 | 0181 | 0281 | 0381 | 0481 | 2081 | 3081 | 4081 | 4.5 | 45.0 | 56.0 | 6 |
| 22 | C | 10 | 0182 | 0282 | 0382 | 0482 | 2082 | 3082 | 4082 | 10.0 | 100 | 125 | 6 |
| 22 | C | 20 | 0183 | 0283 | 0383 | 0483 | 2083 | 3083 | 4083 | 10.0 | 100 | 125 | 6 |
| 27 | C | 10 | 0184 | 0284 | 0384 | 0484 | 2084 | 3084 | 4084 | 10.0 | 100 | 125 | 6 |
| 33 | D | 10 | 0185 | 0285 | 0385 | 0485 | 2085 | 3085 | 4085 | 10.0 | 100 | 125 | 6 |
| 33 | D | 20 | 0186 | 0286 | 0386 | 0486 | 2086 | 3086 | 4086 | 10.0 | 100 | 125 | 6 |
| 39 | D | 10 | 0187 | 0287 | 0387 | 0487 | 2087 | 3087 | 4087 | 10.0 | 100 | 125 | 6 |



| STANDARD PACKAGING QUANTITY | | | | | |
|-----------------------------|----------------------------|------------------|---------------------|---------------|---------|
| CASE CODE | QUANTITY (pcs/reel) | | | BULK QUANTITY | |
| | FULL REEL /TR; /RR; /WR | HALF REEL /HR | PARTIAL REEL /PR | PER TRAY | PER BOX |
| A | 1000 | 500 | 100 | n/a | 100 |
| B | 1000 | 500 | 100 | 20 | 100 |
| C | 500 | 250 | 100 | 20 | 100 |
| D | 500 | 250 | 100 | 20 | 80 |

| INSIDE TAPE SPACING | | |
|---------------------|-----------|------------------------------|
| PACKAGING OPTION | CASE CODE | TAPE SPACING |
| /TR; /HR; /PR | A, B | 2.47 ± 0.02 [62.7 ± 0.51] |
| | C, D | 2.88 ± 0.02 [73.0 ± 0.51] |
| /RR | A, B | 2.05 ± 0.02 [52.1 ± 0.51] |
| | C, D | 2.47 ± 0.02 [62.7 ± 0.51] |
| /WR | A, B | - |
| | C, D | 2.05 ± 0.02 [52.1 ± 0.51] |

| PRODUCT INFORMATION | |
|--|--|
| Mounting of Through-Hole Components | www.vishay.com/doc?40108 |
| Solid Tantalum Capacitors (With MnO ₂ Electrolyte) Voltage Derating | www.vishay.com/doc?40246 |
| SELECTOR GUIDES | |
| Selector Guide | www.vishay.com/doc?49054 |
| FAQ | |
| Frequently Asked Questions | www.vishay.com/doc?40110 |



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