

## Solid-Electrolyte TANTALEX™ Capacitors, Military MIL-PRF-39003/09 Qualified, Style CSR21



### FEATURES

- Hermetically sealed
- Metal cased
- Axial lead
- Weibull failure rates B, C, D
- Exponential failure rates M, P, R, S
- Low ESR
- 100 % surge current test
- 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:** 5.6 µF to 330 µF

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

**Voltage Rating:** 6 V<sub>DC</sub> to 50 V<sub>DC</sub>

### 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 CSR21. 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 CSR21, M39003/09 MIL-PRF-39003/9

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.

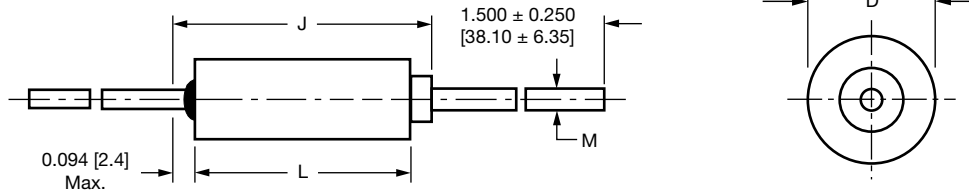
In addition, each order for military style CSR13, CSR21, CSR23 capacitors requiring government inspection must state whether inspection is to be at the destination or at the Vishay plant. Orders requiring source inspection cannot be shipped until this has been accomplished.

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

ORDERING INFORMATION				
<u>M39003</u>	<u>/09</u>	<u>-2085</u>	<u>B</u>	<u>/TR</u>
BASIC DOCUMENT NUMBER	SLASH SHEET	DASH NUMBER	SURGE CURRENT OPTION LETTER	PACKAGING OPTION <sup>(1)</sup>
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, +25 °C, after Weibull B = -55 °C and +85 °C, after Weibull C = -55 °C and +85 °C, before Weibull E = -55 °C and +85 °C, after Weibull, high temperature solder F = -55 °C and +85 °C, before Weibull, high temperature solder H = +25 °C, after Weibull, high temperature solder	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**

<sup>(1)</sup> 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.)
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
5.6						C
6.8						C
8.2						C
10						C
12						C
15						C
18						C
22					C	D
27				C	D	
33				C	D	
39				C	D	
47				C	D	
56			C	D		
68			C	D		
82		C		D		
100		C		D		
120		C	D			
150	C		D			
180	C	D				
220		D				
270	D					
330	D					



STANDARD RATINGS																
CAPACITANCE ( $\mu$ F)	CASE CODE	CAP. TOL. ( $\pm$ %)	PART NO. M39003/09- FAILURE RATE LEVEL (%/1000 h)							MAX. DCL ( $\mu$ A) AT			MAX. DF AT +25 °C 1 kHz (%)	MAX. ESR AT +25 °C 100 kHz ( $\Omega$ )	DERATED MAX. RIPPLE CURRENT AT +25 °C (A)	
			M	P	R	S	B	C	D	+25 °C	+85 °C	+125 °C			40 kHz	1 kHz
			1.0	0.1	0.01	0.001	0.1	0.01	0.001							
<b>6 V<sub>DC</sub> AT +85 °C, SURGE = 8 V; 4 V<sub>DC</sub> AT +125 °C</b>																
150	C	5	0001	0101	0201	0301	2001	3001	4001	4.5	90.0	113	10	0.065	3.3	2.0
150	C	10	0002	0102	0202	0302	2002	3002	4002	4.5	90.0	113	10	0.065	3.3	2.0
150	C	20	0003	0103	0203	0303	2003	3003	4003	4.5	90.0	113	10	0.065	3.3	2.0
180	C	5	0004	0104	0204	0304	2004	3004	4004	5.5	110	138	10	0.060	3.4	2.4
180	C	10	0005	0105	0205	0305	2005	3005	4005	5.5	110	138	10	0.060	3.4	2.4
270	D	5	0006	0106	0206	0306	2006	3006	4006	6.5	130	163	10	0.050	4.1	3.4
270	D	10	0007	0107	0207	0307	2007	3007	4007	6.5	130	163	10	0.050	4.1	3.4
330	D	5	0008	0108	0208	0308	2008	3008	4008	7.5	150	188	12	0.045	4.3	3.8
330	D	10	0009	0109	0209	0309	2009	3009	4009	7.5	150	188	12	0.045	4.3	3.8
330	D	20	0010	0110	0210	0310	2010	3010	4010	7.5	150	188	12	0.045	4.3	3.8
<b>10 V<sub>DC</sub> AT +85 °C, SURGE = 13 V; 7 V<sub>DC</sub> AT +125 °C</b>																
82	C	5	0011	0111	0211	0311	2011	3011	4011	4.0	80.0	100	8	0.085	2.9	1.8
82	C	10	0012	0112	0212	0312	2012	3012	4012	4.0	80.0	100	8	0.085	2.9	1.8
100	C	5	0013	0113	0213	0313	2013	3013	4013	5.0	100	125	8	0.075	3.0	2.2
100	C	10	0014	0114	0214	0314	2014	3014	4014	5.0	100	125	8	0.075	3.0	2.2
100	C	20	0015	0115	0215	0315	2015	3015	4015	5.0	100	125	8	0.075	3.0	2.2
120	C	5	0016	0116	0216	0316	2016	3016	4016	6.0	120	150	8	0.070	3.2	2.5
120	C	10	0017	0117	0217	0317	2017	3017	4017	6.0	120	150	8	0.070	3.2	2.5
180	D	5	0018	0118	0218	0318	2018	3018	4018	9.0	180	226	8	0.060	3.7	3.4
180	D	10	0019	0119	0219	0319	2019	3019	4019	9.0	180	226	8	0.060	3.7	3.4
220	D	5	0020	0120	0220	0320	2020	3020	4020	10.0	200	250	10	0.055	3.9	3.4
220	D	10	0021	0121	0221	0321	2021	3021	4021	10.0	200	250	10	0.055	3.9	3.4
220	D	20	0022	0122	0222	0322	2022	3022	4022	10.0	200	250	10	0.055	3.9	3.4
<b>15 V<sub>DC</sub> AT +85 °C, SURGE = 20 V; 10 V<sub>DC</sub> AT +125 °C</b>																
56	C	5	0023	0123	0223	0323	2023	3023	4023	4.0	80.0	100	6	0.100	2.6	1.8
56	C	10	0024	0124	0224	0324	2024	3024	4024	4.0	80.0	100	6	0.100	2.6	1.8
68	C	5	0025	0125	0225	0325	2025	3025	4025	5.0	100	125	6	0.095	2.7	2.2
68	C	10	0026	0126	0226	0326	2026	3026	4026	5.0	100	125	6	0.095	2.7	2.2
68	C	20	0027	0127	0227	0327	2027	3027	4027	5.0	100	125	6	0.095	2.7	2.2
120	D	5	0028	0128	0228	0328	2028	3028	4028	9.0	180	226	8	0.070	3.5	2.8
120	D	10	0029	0129	0229	0329	2029	3029	4029	9.0	180	226	8	0.070	3.5	2.8
150	D	5	0030	0130	0230	0330	2030	3030	4030	10.0	200	250	8	0.065	3.6	3.1
150	D	10	0031	0131	0231	0331	2031	3031	4031	10.0	200	250	8	0.065	3.6	3.1
150	D	20	0032	0132	0232	0332	2032	3032	4032	10.0	200	250	8	0.065	3.6	3.1
<b>20 V<sub>DC</sub> AT +85 °C, SURGE = 26 V; 13 V<sub>DC</sub> AT +125 °C</b>																
27	C	5	0033	0133	0233	0333	2033	3033	4033	2.5	50.0	63.0	5	0.145	2.2	1.2
27	C	10	0034	0134	0234	0334	2034	3034	4034	2.5	50.0	63.0	5	0.145	2.2	1.2
33	C	5	0035	0135	0235	0335	2035	3035	4035	3.5	70.0	88.0	5	0.130	2.3	1.4
33	C	10	0036	0136	0236	0336	2036	3036	4036	3.5	70.0	88.0	5	0.130	2.3	1.4
33	C	20	0037	0137	0237	0337	2037	3037	4037	3.5	70.0	88.0	5	0.130	2.3	1.4
39	C	5	0038	0138	0238	0338	2038	3038	4038	4.0	80.0	100	5	0.120	2.4	1.7
39	C	10	0039	0139	0239	0339	2039	3039	4039	4.0	80.0	100	5	0.120	2.4	1.7
47	C	5	0040	0140	0240	0340	2040	3040	4040	4.5	90.0	113	6	0.110	2.5	1.8



STANDARD RATINGS																
CAPACITANCE ( $\mu$ F)	CASE CODE	CAP. TOL. ( $\pm$ %)	PART NO. M39003/09- FAILURE RATE LEVEL (%/1000 h)							MAX. DCL ( $\mu$ A) AT			MAX. DF AT +25 °C 1 kHz (%)	MAX. ESR AT +25 °C 100 kHz ( $\Omega$ )	DERATED MAX. RIPPLE CURRENT AT +25 °C (A)	
			M	P	R	S	B	C	D	+25 °C	+85 °C	+125 °C			40 kHz	1 kHz
			1.0	0.1	0.01	0.001	0.1	0.01	0.001							
<b>20 V<sub>DC</sub> AT +85 °C, SURGE = 26 V; 13 V<sub>DC</sub> AT +125 °C</b>																
47	C	10	0041	0141	0241	0341	2041	3041	4041	4.5	90.0	113	6	0.110	2.5	1.8
47	C	20	0042	0142	0242	0342	2042	3042	4042	4.5	90.0	113	6	0.110	2.5	1.8
56	D	5	0043	0143	0243	0343	2043	3043	4043	5.5	110	138	6	0.100	2.9	2.2
56	D	10	0044	0144	0244	0344	2044	3044	4044	5.5	110	138	6	0.100	2.9	2.2
68	D	5	0045	0145	0245	0345	2045	3045	4045	7.0	140	175	6	0.095	3.0	2.4
68	D	10	0046	0146	0246	0346	2046	3046	4046	7.0	140	175	6	0.095	3.0	2.4
68	D	20	0047	0147	0247	0347	2047	3047	4047	7.0	140	175	6	0.095	3.0	2.4
82	D	5	0048	0148	0248	0348	2048	3048	4048	8.0	160	200	6	0.085	3.1	2.5
82	D	10	0049	0149	0249	0349	2049	3049	4049	8.0	160	200	6	0.085	3.1	2.5
100	D	5	0050	0150	0250	0350	2050	3050	4050	10.0	200	250	8	0.075	3.3	2.5
100	D	10	0051	0151	0251	0351	2051	3051	4051	10.0	200	250	8	0.075	3.3	2.5
100	D	20	0052	0152	0252	0352	2052	3052	4052	10.0	200	250	8	0.075	3.3	2.5
<b>35 V<sub>DC</sub> AT +85 °C, SURGE = 46 V; 23 V<sub>DC</sub> AT +125 °C</b>																
22	C	5	0053	0153	0253	0353	2053	3053	4053	4.0	80.0	100	4	0.160	2.1	1.5
22	C	10	0054	0154	0254	0354	2054	3054	4054	4.0	80.0	100	4	0.160	2.1	1.5
22	C	20	0055	0155	0255	0355	2055	3055	4055	4.0	80.0	100	4	0.160	2.1	1.5
27	D	5	0056	0156	0256	0356	2056	3056	4056	4.5	90.0	113	4	0.145	2.4	1.9
27	D	10	0057	0157	0257	0357	2057	3057	4057	4.5	90.0	113	4	0.145	2.4	1.9
33	D	5	0058	0158	0258	0358	2058	3058	4058	5.5	110	138	5	0.130	2.5	1.9
33	D	10	0059	0159	0259	0359	2059	3059	4059	5.5	110	138	5	0.130	2.5	1.9
33	D	20	0060	0160	0260	0360	2060	3060	4060	5.5	110	138	5	0.130	2.5	1.9
39	D	5	0061	0161	0261	0361	2061	3061	4061	7.0	140	175	5	0.120	2.6	2.0
39	D	10	0062	0162	0262	0362	2062	3062	4062	7.0	140	175	5	0.120	2.6	2.0
47	D	5	0063	0163	0263	0363	2063	3063	4063	8.0	160	200	5	0.110	2.7	2.2
47	D	10	0064	0164	0264	0364	2064	3064	4064	8.0	160	200	5	0.110	2.7	2.2
47	D	20	0065	0165	0265	0365	2065	3065	4065	8.0	160	200	5	0.110	2.7	2.2
<b>50 V<sub>DC</sub> AT +85 °C, SURGE = 65 V; 33 V<sub>DC</sub> AT +125 °C</b>																
5.6	C	5	0066	0166	0266	0366	2066	3066	4066	2.2	45.0	56.0	3	0.300	1.5	0.6
5.6	C	10	0067	0167	0267	0367	2067	3067	4067	2.2	45.0	56.0	3	0.300	1.5	0.6
6.8	C	5	0068	0168	0268	0368	2068	3068	4068	2.2	45.0	56.0	3	0.275	1.6	0.7
6.8	C	10	0069	0169	0269	0369	2069	3069	4069	2.2	45.0	56.0	3	0.275	1.6	0.7
6.8	C	20	0070	0170	0270	0370	2070	3070	4070	2.2	45.0	56.0	3	0.275	1.6	0.7
8.2	C	5	0071	0171	0271	0371	2071	3071	4071	2.5	50.0	63.0	3	0.250	1.6	0.9
8.2	C	10	0072	0172	0272	0372	2072	3072	4072	2.5	50.0	63.0	3	0.250	1.6	0.9
10	C	5	0073	0173	0273	0373	2073	3073	4073	2.5	50.0	63.0	3	0.230	1.7	1.1
10	C	10	0074	0174	0274	0374	2074	3074	4074	2.5	50.0	63.0	3	0.230	1.7	1.1
10	C	20	0075	0175	0275	0375	2075	3075	4075	2.5	50.0	63.0	3	0.230	1.7	1.1
12	C	5	0076	0176	0276	0376	2076	3076	4076	3.0	60.0	75.0	3	0.210	1.8	1.3
12	C	10	0077	0177	0277	0377	2077	3077	4077	3.0	60.0	75.0	3	0.210	1.8	1.3
15	C	5	0078	0178	0278	0378	2078	3078	4078	4.0	80.0	100	3	0.190	1.9	1.4
15	C	10	0079	0179	0279	0379	2079	3079	4079	4.0	80.0	100	3	0.190	1.9	1.4
15	C	20	0080	0180	0280	0380	2080	3080	4080	4.0	80.0	100	3	0.190	1.9	1.4
18	C	5	0081	0181	0281	0381	2081	3081	4081	4.5	90.0	113	4	0.175	2.0	1.4
18	C	10	0082	0182	0282	0382	2082	3082	4082	4.5	90.0	113	4	0.175	2.0	1.4
22	D	5	0083	0183	0283	0383	2083	3083	4083	5.5	110	138	4	0.160	2.3	1.7
22	D	10	0084	0184	0284	0384	2084	3084	4084	5.5	110	138	4	0.160	2.3	1.7
22	D	20	0085	0185	0285	0385	2085	3085	4085	5.5	110	138	4	0.160	2.3	1.7



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
C	500	250	100	20	100
D	500	250	100	20	80

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

PRODUCT INFORMATION	
Mounting of Through-Hole Components	<a href="http://www.vishay.com/doc?40108">www.vishay.com/doc?40108</a>
Solid Tantalum Capacitors (With MnO <sub>2</sub> Electrolyte) Voltage Derating	<a href="http://www.vishay.com/doc?40246">www.vishay.com/doc?40246</a>
SELECTOR GUIDES	
Selector Guide	<a href="http://www.vishay.com/doc?49054">www.vishay.com/doc?49054</a>
FAQ	
Frequently Asked Questions	<a href="http://www.vishay.com/doc?40110">www.vishay.com/doc?40110</a>



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