Solid-Electrolyte TANTALEX™ Capacitors, Military MIL-PRF-39003/01 Qualified, Style CSR13



FEATURES

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

STYLE, MILITARY SPECIFICATION SHEET

Style CSR13, M39003/01 MIL-PRF-39003/1

PERFORMANCE CHARACTERISTICS

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

Capacitance Range: 0.033 µF to 330 µF

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

Voltage Rating: 6 V_{DC} to 100 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 CSR13. 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 (CSRxxxxxxxx) 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.

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	/01	-2254	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

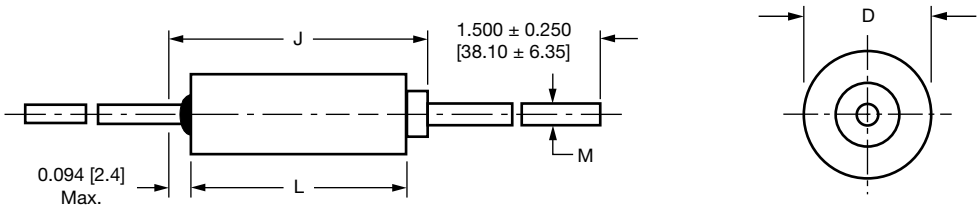
Note

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

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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	75 V	100 V
0.033						A		A
0.039						A		A
0.047						A		A
0.056						A		A
0.068						A		A
0.082						A		A
0.10						A	A	A
0.12						A	A	A
0.15						A	A	A
0.18						A	A	A
0.22						A	A	A
0.27						A	A	A
0.33						A	A	A
0.39						A	A	A
0.47						A	A	A
0.56						A	A	A
0.68						A	A	B
0.82						A	B	B
1.0						A	B	B
1.2				A		B	B	B
1.5				A		B	B	B
1.8				A		B	B	B
2.2				A		B	B	B
2.7			A			B	B	B
3.3			A			B	B	C
3.9		A				B	B	C
4.7		A				B	C	C
5.6	A				B	C	C	C
6.8	A				B	C	C	C

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RATINGS AND CASE CODES

µF	6 V	10 V	15 V	20 V	35 V	50 V	75 V	100 V
8.2				B		C	C	
10				B		C	C	
12				B		C	D	
15				B		C	D	
18			B			C		
22			B		C	D		
27		B		C	D			
33		B		C	D			
39		B		C	D			
47	B			C	D			
56	B		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 (µF)	CASE CODE	CAP. TOL. (± %)	PART NO. M39003/01- FAILURE RATE LEVEL (%/1000 h)								MAX. DCL (µA) AT			MAX. DF (%) AT	
			M 1.0	P 0.1	R 0.01	S 0.001	G 1.0	B 0.1	C 0.01	D 0.001	+25 °C	+85 °C	+125 °C	-55 °C +25 °C	+85 °C +125 °C
6 V_{DC} AT +85 °C, SURGE = 8 V; 4 V_{DC} AT +125 °C															
5.6	A	5	5001	5201	5401	5601	4001	6001	7001	8001	0.3	6	7.5	4	4
5.6	A	10	2241	2481	2721	2961	4002	6002	7002	8002	0.3	6	7.5	4	4
6.8	A	5	5002	5202	5402	5602	4003	6003	7003	8003	0.3	6	7.5	6	6
6.8	A	10	2242	2482	2722	2962	4004	6004	7004	8004	0.3	6	7.5	6	6
6.8	A	20	2243	2483	2723	2963	4005	6005	7005	8005	0.3	6	7.5	6	6
47	B	5	5003	5203	5403	5603	4006	6006	7006	8006	1.5	24	30	6	6
47	B	10	2244	2484	2724	2964	4007	6007	7007	8007	1.5	24	30	6	6
47	B	20	2245	2485	2725	2965	4008	6008	7008	8008	1.5	24	30	6	6
56	B	5	5004	5204	5404	5604	4009	6009	7009	8009	1.5	24	30	6	6
56	B	10	2246	2486	2726	2966	4010	6010	7010	8010	1.5	24	30	6	6
150	C	5	5005	5205	5405	5605	4011	6011	7011	8011	4.5	90	113	8	8
150	C	10	2247	2487	2727	2967	4012	6012	7012	8012	4.5	90	113	8	8
150	C	20	2248	2488	2728	2968	4013	6013	7013	8013	4.5	90	113	8	8
180	C	5	5006	5206	5406	5606	4014	6014	7014	8014	5.5	110	138	8	8
180	C	10	2249	2489	2729	2969	4015	6015	7015	8015	5.5	110	138	8	8
270	D	5	5007	5207	5407	5607	4016	6016	7016	8016	6.5	130	163	8	8
270	D	10	2250	2490	2730	2970	4017	6017	7017	8017	6.5	130	163	8	8
330	D	5	5008	5208	5408	5608	4018	6018	7018	8018	7.5	150	188	8	8
330	D	10	2251	2491	2731	2971	4019	6019	7019	8019	7.5	150	188	8	8
330	D	20	2252	2492	2732	2972	4020	6020	7020	8020	7.5	150	188	8	8

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STANDARD RATINGS

CAPACITANCE (µF)	CASE CODE	CAP. TOL. (± %)	PART NO. M39003/01- FAILURE RATE LEVEL (%/1000 h)								MAX. DCL (µA) AT			MAX. DF (%) AT	
			M 1.0	P 0.1	R 0.01	S 0.001	G 1.0	B 0.1	C 0.01	D 0.001	+25 °C	+85 °C	+125 °C	-55 °C +25 °C	+85 °C +125 °C
10 V_{DC} AT +85 °C, SURGE = 13 V; 7 V_{DC} AT +125 °C															
3.9	A	5	5009	5209	5409	5609	4021	6021	7021	8021	0.3	6	7.5	4	4
3.9	A	10	2253	2493	2733	2973	4022	6022	7022	8022	0.3	6	7.5	4	4
4.7	A	5	5010	5210	5410	5610	4023	6023	7023	8023	0.4	7	8.8	4	4
4.7	A	10	2254	2494	2734	2974	4024	6024	7024	8024	0.4	7	8.8	4	4
4.7	A	20	2255	2495	2735	2975	4025	6025	7025	8025	0.4	7	8.8	4	4
27	B	5	5011	5211	5411	5611	4026	6026	7026	8026	2	40	50	6	6
27	B	10	2256	2496	2736	2976	4027	6027	7027	8027	2	40	50	6	6
33	B	5	5012	5212	5412	5612	4028	6028	7028	8028	2.5	50	63	6	6
33	B	10	2257	2497	2737	2977	4029	6029	7029	8029	2.5	50	63	6	6
33	B	20	2258	2498	2738	2978	4030	6030	7030	8030	2.5	50	63	6	6
39	B	5	5013	5213	5413	5613	4031	6031	7031	8031	2.5	50	63	6	6
39	B	10	2259	2499	2739	2979	4032	6032	7032	8032	2.5	50	63	6	6
82	C	5	5014	5214	5414	5614	4033	6033	7033	8033	4	80	100	6	6
82	C	10	2260	2500	2740	2980	4034	6034	7034	8034	4	80	100	6	6
100	C	5	5015	5215	5415	5615	4035	6035	7035	8035	5	100	125	8	8
100	C	10	2261	2501	2741	2981	4036	6036	7036	8036	5	100	125	8	8
100	C	20	2262	2502	2742	2982	4037	6037	7037	8037	5	100	125	8	8
120	C	5	5016	5216	5416	5616	4038	6038	7038	8038	6	120	150	8	8
120	C	10	2263	2503	2743	2983	4039	6039	7039	8039	6	120	150	8	8
180	D	5	5017	5217	5417	5617	4040	6040	7040	8040	9	180	226	8	8
180	D	10	2264	2504	2744	2984	4041	6041	7041	8041	9	180	226	8	8
220	D	5	5018	5218	5418	5618	4042	6042	7042	8042	10	200	250	8	8
220	D	10	2265	2505	2745	2985	4043	6043	7043	8043	10	200	250	8	8
220	D	20	2266	2506	2746	2986	4044	6044	7044	8044	10	200	250	8	8
15 V_{DC} AT +85 °C, SURGE = 20 V; 10 V_{DC} AT +125 °C															
2.7	A	5	5019	5219	5419	5619	4045	6045	7045	8045	0.3	6	7.5	4	4
2.7	A	10	2267	2507	2747	2987	4046	6046	7046	8046	0.3	6	7.5	4	4
3.3	A	5	5020	5220	5420	5620	4047	6047	7047	8047	0.4	8	10	4	4
3.3	A	10	2268	2508	2748	2988	4048	6048	7048	8048	0.4	8	10	4	4
3.3	A	20	2269	2509	2749	2989	4049	6049	7049	8049	0.4	8	10	4	4
18	B	5	5021	5221	5421	5621	4050	6050	7050	8050	2	35	44	6	6
18	B	10	2270	2510	2750	2990	4051	6051	7051	8051	2	35	44	6	6
22	B	5	5022	5222	5422	5622	4052	6052	7052	8052	2	40	50	6	6
22	B	10	2271	2511	2751	2991	4053	6053	7053	8053	2	40	50	6	6
22	B	20	2272	2512	2752	2992	4054	6054	7054	8054	2	40	50	6	6
56	C	5	5023	5223	5423	5623	4055	6055	7055	8055	4	80	100	6	6
56	C	10	2273	2513	2753	2993	4056	6056	7056	8056	4	80	100	6	6
68	C	5	5024	5224	5424	5624	4057	6057	7057	8057	5	100	125	6	6
68	C	10	2274	2514	2754	2994	4058	6058	7058	8058	5	100	125	6	6
68	C	20	2275	2515	2755	2995	4059	6059	7059	8059	5	100	125	6	6
120	D	5	5025	5225	5425	5625	4060	6060	7060	8060	9	180	226	8	8
120	D	10	2276	2516	2756	2996	4061	6061	7061	8061	9	180	226	8	8
150	D	5	5026	5226	5426	5626	4062	6062	7062	8062	10	200	250	8	8
150	D	10	2277	2517	2757	2997	4063	6063	7063	8063	10	200	250	8	8
150	D	20	2278	2518	2758	2998	4064	6064	7064	8064	10	200	250	8	8

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STANDARD RATINGS

CAPACITANCE (µF)	CASE CODE	CAP. TOL. (± %)	PART NO. M39003/01- FAILURE RATE LEVEL (%/1000 h)								MAX. DCL (µA) AT			MAX. DF (%) AT	
			M 1.0	P 0.1	R 0.01	S 0.001	G 1.0	B 0.1	C 0.01	D 0.001	+25 °C	+85 °C	+125 °C	-55 °C +25 °C	+85 °C +125 °C
20 V_{DC} AT +85 °C, SURGE = 26 V; 13 V_{DC} AT +125 °C															
1.2	A	5	5027	5227	5427	5627	4065	6065	7065	8065	0.3	6	7.5	4	4
1.2	A	10	2279	2519	2759	2999	4066	6066	7066	8066	0.3	6	7.5	4	4
1.5	A	5	5028	5228	5428	5628	4067	6067	7067	8067	0.3	6	7.5	4	4
1.5	A	10	2280	2520	2760	3000	4068	6068	7068	8068	0.3	6	7.5	4	4
1.5	A	20	2281	2521	2761	3001	4069	6069	7069	8069	0.3	6	7.5	4	4
1.8	A	5	5029	5229	5429	5629	4070	6070	7070	8070	0.3	6	7.5	4	4
1.8	A	10	2282	2522	2762	3002	4071	6071	7071	8071	0.3	6	7.5	4	4
2.2	A	5	5030	5230	5430	5630	4072	6072	7072	8072	0.4	8	10	4	4
2.2	A	10	2283	2523	2763	3003	4073	6073	7073	8073	0.4	8	10	4	4
2.2	A	20	2284	2524	2764	3004	4074	6074	7074	8074	0.4	8	10	4	4
8.2	B	5	5031	5231	5431	5631	4075	6075	7075	8075	1	20	25	6	6
8.2	B	10	2285	2525	2765	3005	4076	6076	7076	8076	1	20	25	6	6
10	B	5	5032	5232	5432	5632	4077	6077	7077	8077	1.5	30	38	6	6
10	B	10	2286	2526	2766	3006	4078	6078	7078	8078	1.5	30	38	6	6
10	B	20	2287	2527	2767	3007	4079	6079	7079	8079	1.5	30	38	6	6
12	B	5	5033	5233	5433	5633	4080	6080	7080	8080	1.8	35	44	6	6
12	B	10	2288	2528	2768	3008	4081	6081	7081	8081	1.8	35	44	6	6
15	B	5	5034	5234	5434	5634	4082	6082	7082	8082	2	40	50	6	6
15	B	10	2289	2529	2769	3009	4083	6083	7083	8083	2	40	50	6	6
15	B	20	2290	2530	2770	3010	4084	6084	7084	8084	2	40	50	6	6
27	C	5	5035	5235	5435	5635	4085	6085	7085	8085	2.5	50	63	6	6
27	C	10	2291	2531	2771	3011	4086	6086	7086	8086	2.5	50	63	6	6
33	C	5	5036	5236	5436	5636	4087	6087	7087	8087	3.5	70	88	6	6
33	C	10	2292	2532	2772	3012	4088	6088	7088	8088	3.5	70	88	6	6
33	C	20	2293	2533	2773	3013	4089	6089	7089	8089	3.5	70	88	6	6
39	C	5	5037	5237	5437	5637	4090	6090	7090	8090	4	80	100	6	6
39	C	10	2294	2534	2774	3014	4091	6091	7091	8091	4	80	100	6	6
47	C	5	5038	5238	5438	5638	4092	6092	7092	8092	4.5	90	113	6	6
47	C	10	2295	2535	2775	3015	4093	6093	7093	8093	4.5	90	113	6	6
47	C	20	2296	2536	2776	3016	4094	6094	7094	8094	4.5	90	113	6	6
56	D	5	5039	5239	5439	5639	4095	6095	7095	8095	5.5	110	138	6	6
56	D	10	2297	2537	2777	3017	4096	6096	7096	8096	5.5	110	138	6	6
68	D	5	5040	5240	5440	5640	4097	6097	7097	8097	7	140	175	6	6
68	D	10	2298	2538	2778	3018	4098	6098	7098	8098	7	140	175	6	6
68	D	20	2299	2539	2779	3019	4099	6099	7099	8099	7	140	175	6	6
82	D	5	5041	5241	5441	5641	4100	6100	7100	8100	8	160	200	6	6
82	D	10	2300	2540	2780	3020	4101	6101	7101	8101	8	160	200	6	6
100	D	5	5042	5242	5442	5642	4102	6102	7102	8102	10	200	250	8	8
100	D	10	2301	2541	2781	3021	4103	6103	7103	8103	10	200	250	8	8
100	D	20	2302	2542	2782	3022	4104	6104	7104	8104	10	200	250	8	8
35 V_{DC} AT +85 °C, SURGE = 46 V; 23 V_{DC} AT +125 °C															
5.6	B	5	5043	5243	5443	5643	4105	6105	7105	8105	1.3	25	32	4	4
5.6	B	10	2303	2543	2783	3023	4106	6106	7106	8106	1.3	25	32	4	4
6.8	B	5	5044	5244	5444	5644	4107	6107	7107	8107	1.5	30	38	6	6
6.8	B	10	2304	2544	2784	3024	4108	6108	7108	8108	1.5	30	38	6	6
6.8	B	20	2305	2545	2785	3025	4109	6109	7109	8109	1.5	30	38	6	6
22	C	5	5045	5245	5445	5645	4110	6110	7110	8110	4	80	100	6	6
22	C	10	2306	2546	2786	3026	4111	6111	7111	8111	4	80	100	6	6
22	C	20	2307	2547	2787	3027	4112	6112	7112	8112	4	80	100	6	6
27	D	5	5046	5246	5446	5646	4113	6113	7113	8113	4.5	90	113	6	6
27	D	10	2308	2548	2788	3028	4114	6114	7114	8114	4.5	90	113	6	6
33	D	5	5047	5247	5447	5647	4115	6115	7115	8115	5.5	110	138	6	6
33	D	10	2309	2549	2789	3029	4116	6116	7116	8116	5.5	110	138	6	6
33	D	20	2310	2550	2790	3030	4117	6117	7117	8117	5.5	110	138	6	6
39	D	5	5048	5248	5448	5648	4118	6118	7118	8118	7	140	175	6	6
39	D	10	2311	2551	2791	3031	4119	6119	7119	8119	7	140	175	6	6
47	D	5	5049	5249	5449	5649	4120	6120	7120	8120	8	160	200	6	6
47	D	10	2312	2552	2792	3032	4121	6121	7121	8121	8	160	200	6	6
47	D	20	2313	2553	2793	3033	4122	6122	7122	8122	8	160	200	6	6

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STANDARD RATINGS

CAPACITANCE (µF)	CASE CODE	CAP. TOL. (± %)	PART NO. M39003/01- FAILURE RATE LEVEL (%/1000 h)								MAX. DCL (µA) AT			MAX. DF (%) AT	
			M 1.0	P 0.1	R 0.01	S 0.001	G 1.0	B 0.1	C 0.01	D 0.001	+25 °C	+85 °C	+125 °C	-55 °C +25 °C	+85 °C +125 °C
50 V_{DC} AT +85 °C, SURGE = 65 V; 33 V_{DC} AT +125 °C															
0.033	A	5	5060	5260	5460	5660	4148	6148	7148	8148	0.3	5	6.3	2	4
0.033	A	10	2329	2569	2809	3049	4149	6149	7149	8149	0.3	5	6.3	2	4
0.033	A	20	2330	2570	2810	3050	4150	6150	7150	8150	0.3	5	6.3	2	4
0.039	A	5	5061	5261	5461	5661	4151	6151	7151	8151	0.3	5	6.3	2	4
0.039	A	10	2331	2571	2811	3051	4152	6152	7152	8152	0.3	5	6.3	2	4
0.047	A	5	5062	5262	5462	5662	4153	6153	7153	8153	0.3	5	6.3	2	4
0.047	A	10	2332	2572	2812	3052	4154	6154	7154	8154	0.3	5	6.3	2	4
0.047	A	20	2333	2573	2813	3053	4155	6155	7155	8155	0.3	5	6.3	2	4
0.056	A	5	5063	5263	5463	5663	4156	6156	7156	8156	0.3	5	6.3	2	4
0.056	A	10	2334	2574	2814	3054	4157	6157	7157	8157	0.3	5	6.3	2	4
0.068	A	5	5064	5264	5464	5664	4158	6158	7158	8158	0.3	5	6.3	2	4
0.068	A	10	2335	2575	2815	3055	4159	6159	7159	8159	0.3	5	6.3	2	4
0.068	A	20	2336	2576	2816	3056	4160	6160	7160	8160	0.3	5	6.3	2	4
0.082	A	5	5065	5265	5465	5665	4161	6161	7161	8161	0.3	5	6.3	2	4
0.082	A	10	2337	2577	2817	3057	4162	6162	7162	8162	0.3	5	6.3	2	4
0.10	A	5	5066	5266	5466	5666	4163	6163	7163	8163	0.3	5	6.3	2	4
0.10	A	10	2338	2578	2818	3058	4164	6164	7164	8164	0.3	5	6.3	2	4
0.10	A	20	2339	2579	2819	3059	4165	6165	7165	8165	0.3	5	6.3	2	4
0.12	A	5	5067	5267	5467	5667	4166	6166	7166	8166	0.3	5	6.3	2	4
0.12	A	10	2340	2580	2820	3060	4167	6167	7167	8167	0.3	5	6.3	2	4
0.15	A	5	5068	5268	5468	5668	4168	6168	7168	8168	0.3	5	6.3	2	4
0.15	A	10	2341	2581	2821	3061	4169	6169	7169	8169	0.3	5	6.3	2	4
0.15	A	20	2342	2582	2822	3062	4170	6170	7170	8170	0.3	5	6.3	2	4
0.18	A	5	5069	5269	5469	5669	4171	6171	7171	8171	0.3	5	6.3	2	4
0.18	A	10	2343	2583	2823	3063	4172	6172	7172	8172	0.3	5	6.3	2	4
0.22	A	5	5070	5270	5470	5670	4173	6173	7173	8173	0.3	5	6.3	2	4
0.22	A	10	2344	2584	2824	3064	4174	6174	7174	8174	0.3	5	6.3	2	4
0.22	A	20	2345	2585	2825	3065	4175	6175	7175	8175	0.3	5	6.3	2	4
0.27	A	5	5071	5271	5471	5671	4176	6176	7176	8176	0.3	5	6.3	2	4
0.27	A	10	2346	2586	2826	3066	4177	6177	7177	8177	0.3	5	6.3	2	4
0.33	A	5	5072	5272	5472	5672	4178	6178	7178	8178	0.3	5	6.3	2	4
0.33	A	10	2347	2587	2827	3067	4179	6179	7179	8179	0.3	5	6.3	2	4
0.33	A	20	2348	2588	2828	3068	4180	6180	7180	8180	0.3	5	6.3	2	4
0.39	A	5	5073	5273	5473	5673	4181	6181	7181	8181	0.3	5	6.3	2	4
0.39	A	10	2349	2589	2829	3069	4182	6182	7182	8182	0.3	5	6.3	2	4
0.47	A	5	5074	5274	5474	5674	4183	6183	7183	8183	0.3	5	6.3	2	4
0.47	A	10	2350	2590	2830	3070	4184	6184	7184	8184	0.3	5	6.3	2	4
0.47	A	20	2351	2591	2831	3071	4185	6185	7185	8185	0.3	5	6.3	2	4
0.56	A	5	5075	5275	5475	5675	4186	6186	7186	8186	0.3	5	6.3	2	4
0.56	A	10	2352	2592	2832	3072	4187	6187	7187	8187	0.3	5	6.3	2	4
0.68	A	5	5076	5276	5476	5676	4188	6188	7188	8188	0.3	5	6.3	2	4
0.68	A	10	2353	2593	2833	3073	4189	6189	7189	8189	0.3	5	6.3	2	4
0.68	A	20	2354	2594	2834	3074	4190	6190	7190	8190	0.3	5	6.3	2	4
0.82	A	5	5077	5277	5477	5677	4191	6191	7191	8191	0.3	5	6.3	2	4
0.82	A	10	2355	2595	2835	3075	4192	6192	7192	8192	0.3	5	6.3	2	4
1.0	A	5	5078	5278	5478	5678	4193	6193	7193	8193	0.4	8	10	2	4
1.0	A	10	2356	2596	2836	3076	4194	6194	7194	8194	0.4	8	10	2	4
1.0	A	20	2357	2597	2837	3077	4195	6195	7195	8195	0.4	8	10	2	4
1.2	B	5	5079	5279	5479	5679	4196	6196	7196	8196	0.4	9	11	4	4
1.2	B	10	2358	2598	2838	3078	4197	6197	7197	8197	0.4	9	11	4	4
1.5	B	5	5080	5280	5480	5680	4198	6198	7198	8198	0.6	12	15	4	4
1.5	B	10	2359	2599	2839	3079	4199	6199	7199	8199	0.6	12	15	4	4
1.5	B	20	2360	2600	2840	3080	4200	6200	7200	8200	0.6	12	15	4	4
1.8	B	5	5081	5281	5481	5681	4201	6201	7201	8201	0.7	14	18	4	4
1.8	B	10	2361	2601	2841	3081	4202	6202	7202	8202	0.7	14	18	4	4
2.2	B	5	5082	5282	5482	5682	4203	6203	7203	8203	0.8	17	22	4	4
2.2	B	10	2362	2602	2842	3082	4204	6204	7204	8204	0.8	17	22	4	4
2.2	B	20	2363	2603	2843	3083	4205	6205	7205	8205	0.8	17	22	4	4
2.7	B	5	5083	5283	5483	5683	4206	6206	7206	8206	1	20	25	4	4

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STANDARD RATINGS

CAPACITANCE (µF)	CASE CODE	CAP. TOL. (± %)	PART NO. M39003/01- FAILURE RATE LEVEL (%/1000 h)								MAX. DCL (µA) AT			MAX. DF (%) AT	
			M 1.0	P 0.1	R 0.01	S 0.001	G 1.0	B 0.1	C 0.01	D 0.001	+25 °C	+85 °C	+125 °C	-55 °C +25 °C	+85 °C +125 °C
50 V_{DC} AT +85 °C, SURGE = 65 V; 33 V_{DC} AT +125 °C															
2.7	B	10	2364	2604	2844	3084	4207	6207	7207	8207	1	20	25	4	4
3.3	B	5	5084	5284	5484	5684	4208	6208	7208	8208	1.2	25	32	4	4
3.3	B	10	2365	2605	2845	3085	4209	6209	7209	8209	1.2	25	32	4	4
3.3	B	20	2366	2606	2846	3086	4210	6210	7210	8210	1.2	25	32	4	4
3.9	B	5	5085	5285	5485	5685	4211	6211	7211	8211	1.5	30	38	4	4
3.9	B	10	2367	2607	2847	3087	4212	6212	7212	8212	1.5	30	38	4	4
4.7	B	5	5086	5286	5486	5686	4213	6213	7213	8213	1.7	35	44	4	4
4.7	B	10	2368	2608	2848	3088	4214	6214	7214	8214	1.7	35	44	4	4
4.7	B	20	2369	2609	2849	3089	4215	6215	7215	8215	1.7	35	44	4	4
5.6	C	5	5087	5287	5487	5687	4216	6216	7216	8216	2.2	45	56	4	4
5.6	C	10	2370	2610	2850	3090	4217	6217	7217	8217	2.2	45	56	4	4
6.8	C	5	5088	5288	5488	5688	4218	6218	7218	8218	2.2	45	56	6	6
6.8	C	10	2371	2611	2851	3091	4219	6219	7219	8219	2.2	45	56	6	6
6.8	C	20	2372	2612	2852	3092	4220	6220	7220	8220	2.2	45	56	6	6
8.2	C	5	5089	5289	5489	5689	4221	6221	7221	8221	2.5	50	63	6	6
8.2	C	10	2373	2613	2853	3093	4222	6222	7222	8222	2.5	50	63	6	6
10	C	5	5090	5290	5490	5690	4223	6223	7223	8223	2.5	50	63	6	6
10	C	10	2374	2614	2854	3094	4224	6224	7224	8224	2.5	50	63	6	6
10	C	20	2375	2615	2855	3095	4225	6225	7225	8225	2.5	50	63	6	6
12	C	5	5091	5291	5491	5691	4226	6226	7226	8226	3	60	75	6	6
12	C	10	2376	2616	2856	3096	4227	6227	7227	8227	3	60	75	6	6
15	C	5	5092	5292	5492	5692	4228	6228	7228	8228	4	80	100	6	6
15	C	10	2377	2617	2857	3097	4229	6229	7229	8229	4	80	100	6	6
15	C	20	2378	2618	2858	3098	4230	6230	7230	8230	4	80	100	6	6
18	C	5	5093	5293	5493	5693	4231	6231	7231	8231	4.5	90	113	6	6
18	C	10	2379	2619	2859	3099	4232	6232	7232	8232	4.5	90	113	6	6
22	D	5	5094	5294	5494	5694	4233	6233	7233	8233	5.5	110	138	6	6
22	D	10	2380	2620	2860	3100	4234	6234	7234	8234	5.5	110	138	6	6
22	D	20	2381	2621	2861	3101	4235	6235	7235	8235	5.5	110	138	6	6
75 V_{DC} AT +85 °C, SURGE = 98 V; 50 V_{DC} AT +125 °C															
0.10	A	5	5095	5295	5495	5695	4236	6236	7236	8236	0.3	5	6.3	2	4
0.10	A	10	2382	2622	2862	3102	4237	6237	7237	8237	0.3	5	6.3	2	4
0.10	A	20	2383	2623	2863	3103	4238	6238	7238	8238	0.3	5	6.3	2	4
0.12	A	5	5096	5296	5496	5696	4239	6239	7239	8239	0.3	5	6.3	2	4
0.12	A	10	2384	2624	2864	3104	4240	6240	7240	8240	0.3	5	6.3	2	4
0.15	A	5	5097	5297	5497	5697	4241	6241	7241	8241	0.3	5	6.3	2	4
0.15	A	10	2385	2625	2865	3105	4242	6242	7242	8242	0.3	5	6.3	2	4
0.15	A	20	2386	2626	2866	3106	4243	6243	7243	8243	0.3	5	6.3	2	4
0.18	A	5	5098	5298	5498	5698	4244	6244	7244	8244	0.3	5	6.3	2	4
0.18	A	10	2387	2627	2867	3107	4245	6245	7245	8245	0.3	5	6.3	2	4
0.22	A	5	5099	5299	5499	5699	4246	6246	7246	8246	0.3	5	6.3	2	4
0.22	A	10	2388	2628	2868	3108	4247	6247	7247	8247	0.3	5	6.3	2	4
0.22	A	20	2389	2629	2869	3109	4248	6248	7248	8248	0.3	5	6.3	2	4
0.27	A	5	5100	5300	5500	5700	4249	6249	7249	8249	0.3	5	6.3	2	4
0.27	A	10	2390	2630	2870	3110	4250	6250	7250	8250	0.3	5	6.3	2	4
0.33	A	5	5101	5301	5501	5701	4251	6251	7251	8251	0.3	5	6.3	2	4
0.33	A	10	2391	2631	2871	3111	4252	6252	7252	8252	0.3	5	6.3	2	4

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STANDARD RATINGS

CAPACITANCE (µF)	CASE CODE	CAP. TOL. (± %)	PART NO. M39003/01- FAILURE RATE LEVEL (%/1000 h)								MAX. DCL (µA) AT			MAX. DF (%) AT	
			M 1.0	P 0.1	R 0.01	S 0.001	G 1.0	B 0.1	C 0.01	D 0.001	+25 °C	+85 °C	+125 °C	-55 °C +25 °C	+85 °C +125 °C
75 V_{DC} AT +85 °C, SURGE = 98 V; 50 V_{DC} AT +125 °C															
0.33	A	20	2392	2632	2872	3112	4253	6253	7253	8253	0.3	5	6.3	2	4
0.39	A	5	5102	5302	5502	5702	4254	6254	7254	8254	0.3	5	6.3	2	4
0.39	A	10	2393	2633	2873	3113	4255	6255	7255	8255	0.3	5	6.3	2	4
0.47	A	5	5103	5303	5503	5703	4256	6256	7256	8256	0.3	5	6.3	2	4
0.47	A	10	2394	2634	2874	3114	4257	6257	7257	8257	0.3	5	6.3	2	4
0.47	A	20	2395	2635	2875	3115	4258	6258	7258	8258	0.3	5	6.3	2	4
0.56	A	5	5104	5304	5504	5704	4259	6259	7259	8259	0.3	5	6.3	2	4
0.56	A	10	2396	2636	2876	3116	4260	6260	7260	8260	0.3	5	6.3	2	4
0.68	A	5	5105	5305	5505	5705	4261	6261	7261	8261	0.3	5	6.3	2	4
0.68	A	10	2397	2637	2877	3117	4262	6262	7262	8262	0.3	5	6.3	2	4
0.68	A	20	2398	2638	2878	3118	4263	6263	7263	8263	0.3	5	6.3	2	4
0.82	B	5	5106	5306	5506	5706	4264	6264	7264	8264	0.3	5	6.3	2	4
0.82	B	10	2399	2639	2879	3119	4265	6265	7265	8265	0.3	5	6.3	2	4
1.0	B	5	5107	5307	5507	5707	4266	6266	7266	8266	0.3	5	6.3	2	4
1.0	B	10	2400	2640	2880	3120	4267	6267	7267	8267	0.3	5	6.3	2	4
1.0	B	20	2401	2641	2881	3121	4268	6268	7268	8268	0.3	5	6.3	2	4
1.2	B	5	5108	5308	5508	5708	4269	6269	7269	8269	0.3	5	6.3	4	4
1.2	B	10	2402	2642	2882	3122	4270	6270	7270	8270	0.3	5	6.3	4	4
1.5	B	5	5109	5309	5509	5709	4271	6271	7271	8271	0.6	10	13	4	4
1.5	B	10	2403	2643	2883	3123	4272	6272	7272	8272	0.6	10	13	4	4
1.5	B	20	2404	2644	2884	3124	4273	6273	7273	8273	0.6	10	13	4	4
1.8	B	5	5110	5310	5510	5710	4274	6274	7274	8274	0.7	10	13	4	4
1.8	B	10	2405	2645	2885	3125	4275	6275	7275	8275	0.7	10	13	4	4
2.2	B	5	5111	5311	5511	5711	4276	6276	7276	8276	0.8	15	19	4	4
2.2	B	10	2406	2646	2886	3126	4277	6277	7277	8277	0.8	15	19	4	4
2.2	B	20	2407	2647	2887	3127	4278	6278	7278	8278	0.8	15	19	4	4
2.7	B	5	5112	5312	5512	5712	4279	6279	7279	8279	1	15	19	4	4
2.7	B	10	2408	2648	2888	3128	4280	6280	7280	8280	1	15	19	4	4
3.3	B	5	5113	5313	5513	5713	4281	6281	7281	8281	1.2	20	25	4	4
3.3	B	10	2409	2649	2889	3129	4282	6282	7282	8282	1.2	20	25	4	4
3.3	B	20	2410	2650	2890	3130	4283	6283	7283	8283	1.2	20	25	4	4
3.9	B	5	5114	5314	5514	5714	4284	6284	7284	8284	1.5	20	25	4	4
3.9	B	10	2411	2651	2891	3131	4285	6285	7285	8285	1.5	20	25	4	4
4.7	C	5	5115	5315	5515	5715	4286	6286	7286	8286	3	60	75	4	4
4.7	C	10	2412	2652	2892	3132	4287	6287	7287	8287	3	60	75	4	4
4.7	C	20	2413	2653	2893	3133	4288	6288	7288	8288	3	60	75	4	4
5.6	C	5	5116	5316	5513	5716	4289	6289	7289	8289	3	60	75	4	4
5.6	C	10	2414	2654	2894	3134	4290	6290	7290	8290	3	60	75	4	4
6.8	C	5	5117	5317	5517	5717	4291	6291	7291	8291	5	100	125	6	6
6.8	C	10	2415	2655	2895	3135	4292	6292	7292	8292	5	100	125	6	6
6.8	C	20	2416	2656	2896	3136	4293	6293	7293	8293	5	100	125	6	6
8.2	C	5	5118	5318	5518	5718	4294	6294	7294	8294	5	100	125	6	6
8.2	C	10	2417	2657	2897	3137	4295	6295	7295	8295	5	100	125	6	6
10	C	5	5119	5319	5519	5719	4296	6296	7296	8296	5	100	125	6	6
10	C	10	2418	2658	2898	3138	4297	6297	7297	8297	5	100	125	6	6
10	C	20	2419	2659	2899	3139	4298	6298	7298	8295	5	100	125	6	6
12	D	5	5120	5320	5520	5720	4299	6299	7299	8299	5	100	125	6	6
12	D	10	2420	2660	2900	3140	4300	6300	7300	8300	5	100	125	6	6
15	D	5	5121	5321	5521	5721	4301	6301	7301	8301	7	140	175	6	6
15	D	10	2421	2661	2901	3141	4302	6302	7302	8302	7	140	175	6	6
15	D	20	2422	2662	2902	3142	4303	6303	7303	8303	7	140	175	6	6

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STANDARD RATINGS

CAPACITANCE (µF)	CASE CODE	CAP. TOL. (± %)	PART NO. M39003/01- FAILURE RATE LEVEL (%/1000 h)								MAX. DCL (µA) AT			MAX. DF (%) AT	
			M 1.0	P 0.1	R 0.01	S 0.001	G 1.0	B 0.1	C 0.01	D 0.001	+25 °C	+85 °C	+125 °C	-55 °C +25 °C	+85 °C +125 °C
100 V_{DC} AT +85 °C, SURGE = 130 V; 67 V_{DC} AT +125 °C															
0.033	A	5	5132	5332	5532	5732	4329	6329	7329	8329	0.3	5	6.3	2	4
0.033	A	10	2438	2678	2918	3158	4330	6330	7330	8330	0.3	5	6.3	2	4
0.033	A	20	2439	2679	2919	3159	4331	6331	7331	8331	0.3	5	6.3	2	4
0.039	A	5	5133	5333	5533	5733	4332	6332	7332	8332	0.3	5	6.3	2	4
0.039	A	10	2440	2680	2920	3160	4333	6333	7333	8333	0.3	5	6.3	2	4
0.047	A	5	5134	5334	5534	5734	4334	6334	7334	8334	0.3	5	6.3	2	4
0.047	A	10	2441	2681	2921	3161	4335	6335	7335	8335	0.3	5	6.3	2	4
0.047	A	20	2442	2682	2922	3162	4336	6336	7336	8336	0.3	5	6.3	2	4
0.056	A	5	5135	5335	5535	5735	4337	6337	7337	8337	0.3	5	6.3	2	4
0.056	A	10	2443	2683	2923	3163	4338	6338	7338	8338	0.3	5	6.3	2	4
0.068	A	5	5136	5336	5536	5736	4339	6339	7339	8339	0.3	5	6.3	2	4
0.068	A	10	2444	2684	2924	3164	4340	6340	7340	8340	0.3	5	6.3	2	4
0.068	A	20	2445	2685	2925	3165	4341	6341	7341	8341	0.3	5	6.3	2	4
0.082	A	5	5137	5337	5537	5737	4342	6342	7342	8342	0.3	5	6.3	2	4
0.082	A	10	2446	2686	2926	3166	4343	6343	7343	8343	0.3	5	6.3	2	4
0.10	A	5	5138	5338	5538	5738	4344	6344	7344	8344	0.3	5	6.3	2	4
0.10	A	10	2447	2687	2927	3167	4345	6345	7345	8345	0.3	5	6.3	2	4
0.10	A	20	2448	2688	2928	3168	4346	6346	7346	8346	0.3	5	6.3	2	4
0.12	A	5	5139	5339	5539	5739	4347	6347	7347	8347	0.3	5	6.3	2	4
0.12	A	10	2449	2689	2929	3169	4348	6348	7348	8348	0.3	5	6.3	2	4
0.15	A	5	5140	5340	5540	5740	4349	6349	7349	8349	0.3	5	6.3	2	4
0.15	A	10	2450	2690	2930	3170	4350	6350	7350	8350	0.3	5	6.3	2	4
0.15	A	20	2451	2691	2931	3171	4351	6351	7351	8351	0.3	5	6.3	2	4
0.18	A	5	5141	5341	5541	5741	4352	6352	7352	8352	0.3	5	6.3	2	4
0.18	A	10	2452	2692	2932	3172	4353	6353	7353	8353	0.3	5	6.3	2	4
0.22	A	5	5142	5342	5542	5742	4354	6354	7354	8354	0.3	5	6.3	2	4
0.22	A	10	2453	2693	2933	3173	4355	6355	7355	8355	0.3	5	6.3	2	4
0.22	A	20	2454	2694	2934	3174	4356	6356	7356	8356	0.3	5	6.3	2	4
0.27	A	5	5143	5343	5543	5743	4357	6357	7357	8357	0.3	5	6.3	2	4
0.27	A	10	2455	2695	2935	3175	4358	6358	7358	8358	0.3	5	6.3	2	4
0.33	A	5	5144	5344	5544	5744	4359	6359	7359	8359	0.3	5	6.3	2	4
0.33	A	10	2456	2696	2936	3176	4360	6360	7360	8360	0.3	5	6.3	2	4
0.33	A	20	2457	2697	2937	3177	4361	6361	7361	8361	0.3	5	6.3	2	4
0.39	A	5	5145	5345	5545	5745	4362	6362	7362	8362	0.3	5	6.3	2	4
0.39	A	10	2458	2698	2938	3178	4363	6363	7363	8363	0.3	5	6.3	2	4
0.47	A	5	5146	5346	5546	5746	4364	6364	7364	8364	0.3	5	6.3	2	4
0.47	A	10	2459	2699	2939	3179	4365	6365	7365	8365	0.3	5	6.3	2	4
0.47	A	20	2460	2700	2940	3180	4366	6366	7366	8366	0.3	5	6.3	2	4
0.56	A	5	5147	5347	5547	5747	4367	6367	7367	8367	0.3	5	6.3	2	4
0.56	A	10	2461	2701	2941	3181	4368	6368	7368	8368	0.3	5	6.3	2	4
0.68	B	5	5148	5348	5548	5748	4369	6369	7369	8369	0.3	5	6.3	2	4
0.68	B	10	2462	2702	2942	3182	4370	6370	7370	8370	0.3	5	6.3	2	4
0.68	B	20	2463	2703	2943	3183	4371	6371	7371	8371	0.3	5	6.3	2	4
0.82	B	5	5149	5349	5549	5749	4372	6372	7372	8372	0.4	5	6.3	2	4
0.82	B	10	2464	2704	2944	3184	4373	6373	7373	8373	0.4	5	6.3	2	4
1.0	B	5	5150	5350	5550	5750	4374	6374	7374	8374	0.5	5	6.3	2	4

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STANDARD RATINGS

CAPACITANCE (µF)	CASE CODE	CAP. TOL. (± %)	PART NO. M39003/01- FAILURE RATE LEVEL (%/1000 h)								MAX. DCL (µA) AT			MAX. DF (%) AT	
			M 1.0	P 0.1	R 0.01	S 0.001	G 1.0	B 0.1	C 0.01	D 0.001	+25 °C	+85 °C	+125 °C	-55 °C +25 °C	+85 °C +125 °C
100 V_{DC} AT +85 °C, SURGE = 130 V; 67 V_{DC} AT +125 °C															
1.0	B	10	2465	2705	2945	3185	4375	6375	7375	8375	0.5	5	6.3	2	4
1.0	B	20	2466	2706	2946	3186	4376	6376	7376	8376	0.5	5	6.3	2	4
1.2	B	5	5151	5351	5551	5751	4377	6377	7377	8377	0.5	5	6.3	4	4
1.2	B	10	2467	2707	2947	3187	4378	6378	7378	8378	0.5	5	6.3	4	4
1.5	B	5	5152	5352	5552	5752	4379	6379	7379	8379	0.7	10	13	4	4
1.5	B	10	2468	2708	2948	3188	4380	6380	7380	8380	0.7	10	13	4	4
1.5	B	20	2469	2709	2949	3189	4381	6381	7381	8381	0.7	10	13	4	4
1.8	B	5	5153	5353	5553	5753	4382	6382	7382	8382	0.7	10	13	4	4
1.8	B	10	2470	2710	2950	3190	4383	6383	7383	8383	0.7	10	13	4	4
2.2	B	5	5154	5354	5554	5754	4384	6384	7384	8384	0.9	15	19	4	4
2.2	B	10	2471	2711	2951	3191	4385	6385	7385	8385	0.9	15	19	4	4
2.2	B	20	2472	2712	2952	3192	4386	6386	7386	8386	0.9	15	19	4	4
2.7	B	5	5155	5355	5555	5755	4387	6387	7387	8387	1.1	15	19	4	4
2.7	B	10	2473	2713	2953	3193	4388	6388	7388	8388	1.1	15	19	4	4
3.3	C	5	5156	5356	5556	5756	4389	6389	Not QPL	Not QPL	1.5	30	38	6	6
3.3	C	10	5157	5357	5557	5757	4390	6390	Not QPL	Not QPL	1.5	30	38	6	6
3.3	C	20	5158	5358	5558	5758	4391	6391	Not QPL	Not QPL	1.5	30	38	6	6
3.9	C	5	5159	5359	5559	5759	4392	6392	Not QPL	Not QPL	1.5	30	38	6	6
3.9	C	10	5160	5360	5560	5760	4393	6393	Not QPL	Not QPL	1.5	30	38	6	6
4.7	C	5	5161	5361	5561	5761	4394	6394	Not QPL	Not QPL	2.5	50	63	6	6
4.7	C	10	5162	5362	5562	5762	4395	6395	Not QPL	Not QPL	2.5	50	63	6	6
4.7	C	20	5163	5363	5563	5763	4396	6396	Not QPL	Not QPL	2.5	50	63	6	6
5.6	C	5	5164	5364	5564	5764	4397	6397	Not QPL	Not QPL	2.5	50	63	6	6
5.6	C	10	5165	5365	5565	5765	4398	6398	Not QPL	Not QPL	2.5	50	63	6	6
6.8	C	5	5166	5366	5566	5766	4399	6399	Not QPL	Not QPL	2.5	50	63	6	6
6.8	C	10	5167	5367	5567	5767	4400	6400	Not QPL	Not QPL	2.5	50	63	6	6
6.8	C	20	5168	5368	5568	5768	4401	6401	Not QPL	Not QPL	2.5	50	63	6	6

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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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