CAPACITORS, FIXED, TUBULAR, POROUS TANTALUM CATHODE AND ANODE, GELLED ELECTROLYTE, HERMETICALLY SEALED BASED ON TYPE CLR79

ESCC Detail Specification No. 3003/005

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DCR No.	CHANGE DESCRIPTION
772	Specification upissued to incorporate editorial changes per DCR.

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1 GENERAL

1.1 SCOPE

This specification details the ratings, physical and electrical characteristics, test and inspection data for Capacitors, Fixed, Tubular, Porous Tantalum Cathode and Anode, Gelled Electrolyte, Hermetically Sealed, based on Type CLR79. It shall be read in conjunction with ESCC Generic Specification No. 3003, the requirements of which are supplemented herein.

1.2 RANGE OF COMPONENTS

The range of capacitors covered by this specification is given in Table 1(a).

1.3 MAXIMUM RATINGS

The maximum ratings, which shall not be exceeded at any time during use or storage, applicable to the capacitors specified herein are scheduled in Table 1(b).

1.4 PARAMETER DERATING INFORMATION

The parameter derating information applicable to the capacitors specified herein is shown in Figure 1.

1.5 PHYSICAL DIMENSIONS

The physical dimensions of the capacitors specified herein are shown in Figure 2.

1.6 FUNCTIONAL DIAGRAM

The functional diagram for the capacitors specified herein is shown in Figure 3.

2 APPLICABLE DOCUMENTS

The following documents form part of this specification and shall be read in conjunction with it:

(a) ESCC Generic Specification No. 3003 for Capacitors, Fixed, Tantalum, Non-solid Electrolyte.
(b) MIL-STD-202, Test Methods for Electronic and Electrical Component Parts.

TABLE 1(a) - RANGE OF COMPONENTS

U_R Volts	C µF	I_L (µA) at		DF (%) at 100Hz			ΔC/C (%)			(Z) (Ω) at 100Hz	Case Size	Max. Weight (g)
		+22ºC	+85/ +125 ºC	+22 ºC	+125 ºC	-55 ºC	+85 ºC	+125 ºC	-55 ºC	-55 ºC		
6	30	1	2	9	10	80	10	12	-40	100	A	2.6
6	68	1	2	15	15	120	14	16	-40	60	A	2.6
6	140	1	3	21	21	290	16	16	-40	40	B	6.2
6	160	2	9	41	41	328	16	16	-42	80	A	2.6
6	270	1	7	45	41	352	17	20	-44	25	B	6.2
6	330	2	8	36	36	320	14	16	-44	20	C	11.6
6	560	2	10	106	106	850	20	20	-68	48	B	6.2
6	560	2	16	55	50	440	18	20	-64	25	C	11.6
6	1200	3	14	90	86	720	25	25	-80	20	D	17.7
6	1500	5	20	172	172	1376	25	25	-90	36	C	11.6
6	2200	6	24	170	170	1360	25	25	-90	22	D	17.7
6.3	68	1	2	15	15	120	14	16	-40	60	A	2.6
6.3	120	1.5	3	21	21	210	15	16	-41	81	A	2.6
6.3	150	2	9	34	34	300	16	16	-42	80	A	2.6
6.3	220	1	6.5	40	36	320	16	18	-44	30	B	6.2
6.3	470	2	10	90	90	720	20	20	-60	46	B	6.2
6.3	560	2	10	106	106	850	20	20	-68	48	B	6.2
6.3	560	2	16	50	50	440	18	20	-64	25	C	11.6
6.3	1000	3	14	72	68	576	25	25	-80	22	D	17.7
6.3	1500	5	20	172	172	1375	25	25	-90	36	C	11.6
6.3	1800	6	24	136	136	1090	25	30	-90	13	D	17.7
6.3	2200	6	24	170	170	1360	25	25	-90	22	D	17.7
8	25	1	2	7.5	6.0	60	10.5	12	-40	100	A	2.6
8	56	1	2	14	14	112	14	16	-40	59	A	2.6
8	120	2	6	32	32	300	17.5	20	-44	80	A	2.6
8	120	1	2	20	20	160	17.5	20	-44	50	B	6.2
8	220	1	7	40	36	320	16	18	-44	30	B	6.2
8	290	2	6	34	33	320	17.5	20	-64	25	C	11.6
8	430	2	10	64	60	420	17.5	20	-64	54	B	6.2
8	430	2	15	46	42	368	17.5	20	-64	25	C	11.6
8	850	3	16	60	56	480	25	25	-80	22	D	17.7
10	20	1	2	6	6	48	10.5	12	-32	175	A	2.6
10	47	1	2	13	13	104	14	16	-36	100	A	2.6
10	68	1.5	3	21	21	170	15	16	-40	85	A	2.6
10	82	2	6	25	25	200	16	16	-40	84	A	2.6
10	100	2	6	30	30	260	16	16	-40	82	A	2.6
10	100	1	4	15	15	120	14	16	-36	60	B	6.2
10	150	1	7	30	28	240	14	16	-32	45	B	6.2
10	180	1	7	30	30	264	14	16	-35	40	B	6.2

U_R Volts	C µF	I_L (µA) at		DF (%) at 100Hz			ΔC/C (%)			(Z) (Ω) at 100Hz	Case Size	Max. Weight (g)
		+22ºC	+85/ +125 ºC	+22 ºC	+125 ºC	-55 ºC	+85 ºC	+125 ºC	-55 ºC	-55 ºC		
10	250	2	10	30	30	240	14	16	-40	30	C	11.6
10	300	2	10	60	60	480	16	18	-54	52	B	6.2
10	330	2	10	65	65	520	17	18	-54	52	B	6.2
10	350	2	10	68	68	544	18	18	-60	52	B	6.2
10	390	2	10	74	74	592	19	20	-60	54	B	6.2
10	390	2	15	44	41	352	18	20	-64	25	C	11.6
10	470	2	15	44	44	384	18	20	-65	25	C	11.6
10	680	3	16	46	42	368	25	25	-80	20	D	17.7
10	750	3	16	50	46	400	25	25	-80	23	D	17.7
10	820	3	16	57	53	456	25	25	-80	22	D	17.7
10	850	4	16	111	111	888	25	25	-84	36	C	11.6
10	1000	4	16	92	92	736	25	25	-80	36	C	11.6
10	1200	5	20	137	137	1096	25	25	-80	36	C	11.6
10	1500	7	25	114	114	912	30	30	-88	23	D	17.7
10	1800	7	25	138	138	1104	30	30	-88	24	D	17.7
15	15	1	2	5	5	40	10.5	12	-24	155	A	2.6
15	33	1	2	10	10	80	14	16	-28	90	A	2.6
15	47	1.5	3	20	20	160	16	16	-28	100	A	2.6
15	56	1.5	3	22	22	176	16	16	-28	100	A	2.6
15	70	1	4	13	13	104	14	16	-28	75	B	6.2
15	120	1	7	25	25	200	14	16	-28	50	B	6.2
15	170	2	10	25	25	200	14	16	-32	35	C	11.6
15	220	2	10	42	42	340	16	16	-35	62	B	6.2
15	270	2	12	55	55	440	18	18	-45	60	B	6.2
15	270	2	14	43	40	344	18	20	-56	30	C	11.6
15	290	2	12	60	60	480	18	18	-54	65	B	6.2
15	540	3	18	40	36	320	25	25	-80	23	D	17.7
15	750	6	24	95	95	760	25	25	-80	42	C	11.6
15	850	8	32	95	95	760	25	25	-80	24	D	17.7
15	1200	8	32	103	103	824	25	30	-84	25	D	17.7
16	33	1	2	10	10	80	14	16	-28	90	A	2.6
16	47	1.5	3	20	20	160	16	16	-28	100	A	2.6
16	56	1.5	3	22	22	176	16	16	-28	100	A	2.6
16	120	1	7	25	25	200	14	16	-28	50	B	6.2
16	220	2	10	42	42	340	16	16	-35	62	B	6.2
16	270	2	12	55	55	440	18	18	-45	60	B	6.2
16	330	2	14	40	40	344	18	20	-58	30	C	11.6
16	330	2	14	40	40	344	18	20	-58	30	C	11.6
16	470	3	18	37	33	296	25	25	-75	24	D	17.7
16	560	3	18	40	36	320	25	25	-80	23	D	17.7

U_R Volts	C µF	I_L (µA) at		DF (%) at 100Hz			ΔC/C (%)			(Z) (Ω) at 100Hz	Case Size	Max. Weight (g)
		+22ºC	+85/ +125 ºC	+22 ºC	+125 ºC	-55 ºC	+85 ºC	+125 ºC	-55 ºC	-55 ºC		
16	680	5	20	80	80	640	25	25	-80	42	C	11.6
16	820	6	24	95	95	760	25	25	-80	42	C	11.6
16	1000	8	32	92	92	736	25	25	-82	25	D	11.7
16	1200	8	32	103	103	824	25	30	-84	25	D	17.7
25	10	1	2	4	4	32	8	9	-16	220	A	2.6
25	22	1	2	7	7	56	10	12	-20	140	A	2.6
25	27	1.5	3	11	11	94	12	12	-20	140	A	2.6
25	33	1.5	3	13	13	106	14	14	-24	130	A	2.6
25	39	2	9	16	16	128	16	16	-28	120	A	2.6
25	43	2	9	18	18	144	16	16	-28	120	A	2.6
25	50	1	2.0	11	11	88	13	15	-28	70	B	6.2
25	100	1	9.0	21	21	168	13	15	-28	50	B	6.2
25	120	2	6.0	21	21	168	13	15	-32	38	C	11.6
25	150	2	10	35	32	270	15	15	-35	62	B	6.2
25	160	2	10	34	34	290	15	15	-35	60	B	6.2
25	180	2	10	35	34	290	14	15	-48	60	B	6.2
25	180	2	13	28	28	224	14	15	-48	32	C	6.2
25	220	2	13	35	33	280	18	20	-52	33	C	11.6
25	330	3	20	30	28	240	25	25	-60	27	D	17.7
25	350	3	20	35	32	280	25	25	-64	24	D	17.7
25	390	7	28	48	48	384	25	25	-70	48	C	11.6
25	390	3	20	35	32	280	25	25	-68	24	D	17.7
25	470	7	28	48	48	400	25	25	-76	48	C	11.6
25	560	7	28	60	60	480	25	25	-80	48	C	11.6
25	680	8	32	60	60	480	25	25	-80	24	D	17.7
25	820	8	32	82	82	652	25	25	-80	26	D	17.7
25	850	8	32	95	95	760	25	25	-80	26	D	17.7
30	8.0	1	2	4	4	32	8	12	-16	275	A	2.6
30	15	1	2	7	7	56	10	12	-20	175	A	2.6
30	25	1.5	3	11	11	81	12	12	-24	160	A	2.6
30	33	2	9	12	12	104	12	14	-30	160	A	2.6
30	40	1	5	10	10	96	10.5	12	-24	65	B	6.2
30	68	1	9	15	15	120	13	15	-24	60	B	6.2
30	100	2	12	17	17	136	10.5	12	-28	40	C	11.6
30	120	2	10	30	30	220	15	15	-32	60	B	6.2
30	150	2	10	32	32	270	15	15	-35	60	B	6.2
30	150	2	12	23	23	184	14	15	-48	35	C	11.6
30	170	2	12	34	34	290	15	15	-48	65	B	6.2
30	300	6	24	43	43	368	15	15	-60	44	C	11.6
30	300	3	20	30	28	240	25	25	-60	31	D	17.7

U_R Volts	C µF	I_L (µA) at		DF (%) at 100Hz			ΔC/C (%)			(Z) (Ω) at 100Hz	Case Size	Max. Weight (g)
		+22ºC	+85/ +125 ºC	+22 ºC	+125 ºC	-55 ºC	+85 ºC	+125 ºC	-55 ºC	-55 ºC		
30	330	6	24	45	45	375	25	25	-65	52	C	11.6
30	350	8	32	48	48	384	25	25	-70	52	C	11.6
30	390	8	32	55	55	440	25	25	-75	52	C	11.6
30	430	8	32	60	60	480	25	25	-80	54	C	11.6
30	560	9	36	40	40	400	25	30	-80	30	D	17.7
40	12	1	2	6	6	32	8	10	-24	234	A	2.6
40	15	1	2	7	7	56	10	12	-20	175	A	2.6
40	18	1.5	4	10	10	80	12	12	-20	200	A	2.6
40	22	1.5	4	11	11	94	12	12	-24	190	A	2.6
40	68	1	8	15	15	120	13	15	-24	60	B	6.2
40	100	2	10	25	25	190	15	15	-40	60	B	6.2
40	120	2	12	30	30	220	15	15	-32	62	B	6.2
40	150	2	12	23	23	184	14	15	-48	35	C	11.6
40	220	3	22	23	22	184	23	23	-58	27	D	17.7
40	270	7	28	37	37	344	25	25	-60	52	C	11.6
40	330	8	32	43	43	368	25	25	-65	52	C	11.6
40	390	8	32	43	43	344	25	25	-75	30	D	17.7
40	470	9	36	45	45	360	25	25	-80	30	D	17.7
50	5.0	1	2	3	3	28	5	6	-16	400	A	2.6
50	10	1	2	4	4	32	8	9	-20	250	A	2.6
50	18	1.5	3	10	10	80	12	12	-24	200	A	2.6
50	22	2	9	11	11	94	12	12	-24	190	A	2.6
50	25	1	5	8	8	68	10.5	12	-20	95	B	6.2
50	47	1	9	13	13	104	13	15	-24	70	B	6.2
50	60	2	12	12	12	92	10.5	12	-16	45	C	11.6
50	82	2	10	15	15	120	14	15	-32	45	C	11.6
50	100	3	15	25	25	190	15	15	-40	67	B	6.2
50	160	3	22	17	17	136	23	23	-50	27	D	17.7
50	270	8	32	37	37	344	25	25	-60	52	C	11.6
50	350	9	36	40	40	320	25	25	-70	30	D	17.7
50	390	9	36	43	43	344	25	25	-75	30	D	17.7
50	430	10	40	45	45	360	25	25	-80	31	D	17.7
60	4.0	1	2	2.8	2.8	28	5	6	-16	550	A	2.6
60	8.2	1	2	4	4	32	8	9	-20	275	A	2.6
60	20	1	5	7	7	62	10.5	12	-16	105	B	6.2
60	39	1	9	12	12	96	10	12	-24	90	B	6.2
60	50	2	12	10	10	80	10.5	12	-16	50	C	11.6
60	68	2	10	13	13	104	14	15	-30	50	C	11.6
60	82	2	12	22	22	144	15	15	-36	70	B	6.2
60	140	3	22	16	16	128	20	20	-40	28	D	17.7

U_R Volts	C µF	I_L (µA) at		DF (%) at 100Hz			ΔC/C (%)			(Z) (Ω) at 100Hz	Case Size	Max. Weight (g)
		+22ºC	+85/ +125 ºC	+22 ºC	+125 ºC	-55 ºC	+85 ºC	+125 ºC	-55 ºC	-55 ºC		
60	220	8	32	37	37	344	25	25	-50	55	C	11.6
60	270	9	36	26	26	186	25	25	-70	33	D	17.7
60	330	10	40	32	32	248	25	25	-72	31	D	17.7
63	10	1	2	4	4	32	8	9	-20	250	A	2.6
63	12	2	4	7	7	67	8	9	-20	233	A	2.6
63	15	2	9	8	8	72	9	9	-22	220	A	2.6
63	47	1	9	13	13	104	13	15	-24	70	B	6.2
63	56	2	12	18	18	112	14	15	-26	72	B	6.2
63	82	2	12	22	22	144	15	15	-36	70	B	6.2
63	100	2	11	18	18	144	14	15	-37	42	C	11.6
63	120	3	18	20	20	160	18	18	-40	49	C	11.6
63	150	3	22	17	17	136	20	20	-45	27	D	17.7
63	220	8	32	37	37	344	25	25	-50	55	C	11.6
63	270	9	36	26	26	186	24	25	-70	33	D	17.7
63	330	10	40	32	32	248	25	25	-72	31	D	17.7
75	3.5	1	2	2.5	2.5	24	5	6	-16	650	A	2.6
75	6.8	1	2	3	3	24	8	9	-20	300	A	2.6
75	8.2	1.5	3	6	6	36	9	9	-22	280	A	2.6
75	9.0	2	4	6	6	39	9	9	-22	280	A	2.6
75	15	1	5	6	6	56	8	9	-16	150	B	6.2
75	33	1	9	10	10	80	10	12	-24	90	B	6.2
75	40	2	12	9	9	72	10.5	12	-16	60	C	11.6
75	43	2	10	15	15	124	10.5	12	-24	89	B	6.2
75	47	2	10	15	15	124	14	14	-30	87	B	6.2
75	56	2	12	18	18	144	15	15	-30	84	B	6.2
75	56	2	10	11	11	88	14	15	-28	60	C	11.6
75	68	2	12	21	21	168	15	15	-36	86	B	6.2
75	68	2	10	13	13	104	14	15	-30	50	C	11.6
75	82	2	10	15	15	120	15	15	-32	45	C	11.6
75	100	8	32	19	19	150	17	18	-36	60	C	11.6
75	110	3	24	11	11	96	20	20	-35	29	D	17.7
75	120	3	24	12	12	96	20	20	-36	28	D	17.7
75	150	9	36	25	25	200	20	20	-40	60	C	11.6
75	150	9	36	17	17	136	21	22	-48	30	D	17.7
75	180	9	36	28	28	280	22	22	-50	60	C	11.6
75	220	10	40	37	37	296	22	22	-60	32	D	17.7
75	250	10	40	40	40	320	25	25	-68	33	D	17.7
100	4.7	1	2	3	3	24	7	8	-16	500	A	2.6
100	5.6	2	5	6	6	36	8	8	-17	475	A	2.6
100	22	1	9	8	8	64	8	8	-16	100	B	6.2

U_R Volts	C µF	I_L (µA) at		DF (%) at 100Hz			ΔC/C (%)			(Z) (Ω) at 100Hz	Case Size	Max. Weight (g)
		+22ºC	+85/ +125 ºC	+22 ºC	+125 ºC	-55 ºC	+85 ºC	+125 ºC	-55 ºC	-55 ºC		
100	30	3	15	10	10	90	8	8	-16	99	B	6.2
100	30	2	12	7	7	56	8	8	-16	80	C	11.6
100	33	3	15	14	14	92	8	8	-16	95	B	6.2
100	33	2	10	7	7	58	8	8	-16	93	C	11.6
100	39	2	12	10	10	90	12	12	-24	92	B	6.2
100	39	2	10	8	8	64	8	8	-16	90	C	11.6
100	43	2	10	8	8	68	8	8	-20	70	C	11.6
100	47	2	10	9	9	72	10	10	-23	70	C	11.6
100	56	2	10	11	11	88	14	15	-28	60	C	11.6
100	68	10	40	15	15	118	15	15	-30	60	C	11.6
100	68	3	26	8	8	64	15	15	-24	42	D	17.7
100	82	3	24	10	10	80	18	18	-24	39	D	17.7
100	86	3	24	10	10	80	18	18	-24	30	D	17.7
100	100	3	24	11	11	88	20	20	-35	36	D	17.7
125	2.7	1	2	3	3	24	7	8	-16	780	A	2.6
125	3.3	1	2	3	3	24	7	8	-16	600	A	2.6
125	3.6	1	2	3	3	24	7	8	-16	600	A	2.6
125	3.9	2	5	3.5	3.5	28	8	8	-16	557	A	2.6
125	14	1	7	6	6	48	7	8	-16	167	B	6.2
125	15	1	7	6	6	48	7	8	-16	167	B	6.2
125	18	2	10	8	8	56	8	8	-16	133	B	6.2
125	25	2	10	6	6	48	7	8	-16	93	C	11.6
125	39	2	10	8	8	64	8	8	-16	90	C	11.6
125	47	2	10	9	9	72	10	10	-23	70	C	11.6
125	56	3	28	6	6	48	15	15	-25	47	D	17.7
125	68	3	26	8	8	64	15	15	-24	42	D	17.7
125	82	3	24	10	10	80	18	18	-24	39	D	17.7

NOTES

1. Refer to Figure 2 for Type Variant Number assigned to case size.
2. All capacitors are available with a tolerance of ±10 and ±20%.

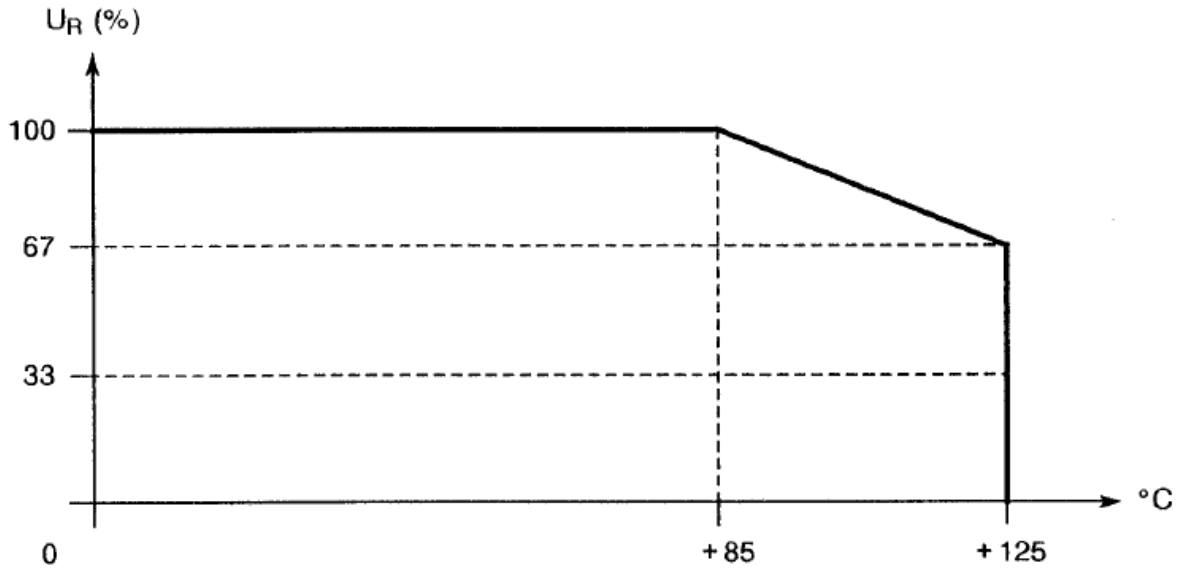
TABLE 1(b) - MAXIMUM RATINGS

No.	Characteristics	Symbol	Limits		Unit	Remarks
			Min.	Max.		
1	Rated Voltage	U_R	See Table 1(a)		V	
2	Surge Voltage	U_S	-	$1.15U_R$	V	
3	Operating Temperature Range	T_{amb}	-55	+125	ºC	For derating, see Figure 1
4	Storage Temperature Range	T_{amb}	-55	+125	ºC	
5	Maximum Soldering Temperature	T_L	-	+260	ºC	Soldering time: $t_L \leq 5$ seconds (1)

NOTES

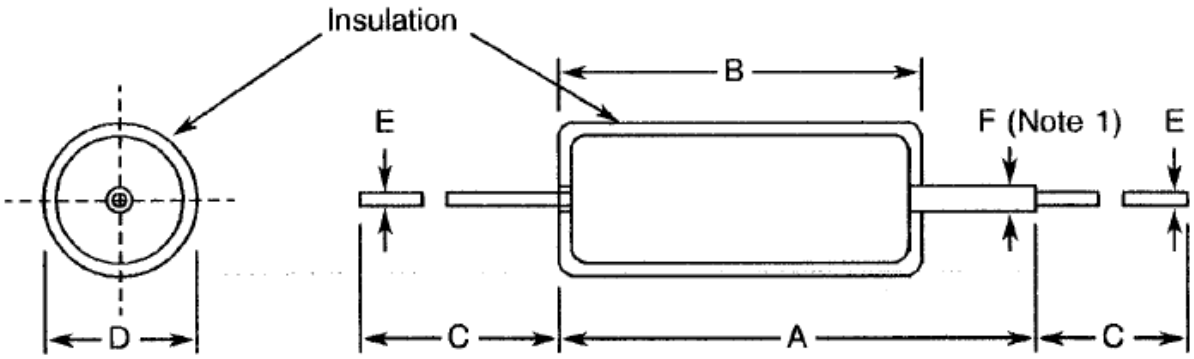
1. 3.0mm from body on negative side and 3.0mm from weld on positive side.

FIGURE 1 - PARAMETER DERATING INFORMATION



Rated Voltage versus Ambient Temperature

FIGURE 2 - PHYSICAL DIMENSIONS

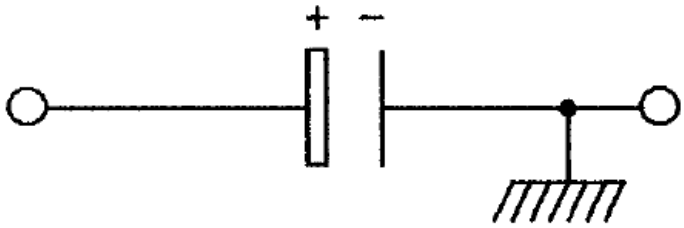


Variant	Case Size	Millimetres						
		A Max.	B Max.	C Min.	D Max.	E		F Max.
						Min.	Max.	
02	A	18	12.43	30	5.6	0.59	0.7	1.6
03	B	23	17.2	30	7.6	0.59	0.7	1.6
04	C	26	20.4	30	10	0.59	0.7	1.6
05	D	34	27.9	30	10	0.59	0.7	1.6

NOTES

1. The anode lead-out stub must not be bent.

FIGURE 3 - FUNCTIONAL DIAGRAM



3 TERMS, DEFINITIONS, ABBREVIATIONS, SYMBOLS AND UNITS

For the purpose of this specification, the terms, definitions, abbreviations, symbols and units specified in ESCC Basic Specification No. 21300 shall apply.

4 REQUIREMENTS

4.1 GENERAL

The complete requirements for procurement of the capacitors specified herein are stated in this specification and ESCC Generic Specification No. 3003 for Capacitors, Fixed, Tantalum, Non-solid Electrolyte. Deviations from the Generic Specification, applicable to this specification only, are listed in Para. 4.2.

Deviations from the applicable Generic Specification and this Detail Specification, formally agreed with specific Manufacturers on the basis that the alternative requirements are equivalent to the ESCC requirements and do not affect the components' reliability, are listed in the appendices attached to this specification.

4.2 DEVIATIONS FROM GENERIC SPECIFICATION

4.2.1 Deviations from Special In-process Controls

Not applicable.

4.2.2 Deviations from Final Production Tests (Chart II)

None.

4.2.3 Deviations from Burn-in Tests (Chart III)

None.

4.2.4 Deviations from Qualification, Environmental and Endurance Tests (Chart IV)

None.

4.2.5 Deviations from Lot Acceptance Tests (Chart V)

None.

4.3 MECHANICAL REQUIREMENTS

4.3.1 Dimension Check

The dimensions of the capacitors specified herein shall be verified in accordance with the requirements set out in Para. 9.4 of ESCC Generic Specification No. 3003 and shall conform to those shown in Figure 2 of this specification.

4.3.2 Weight

The maximum weight of the capacitors specified herein shall be as specified in Table 1(a).

4.3.3 Robustness of Terminations

The requirements and test conditions for robustness of terminations are specified in Section 9 of ESCC Generic Specification No. 3003.

4.4 MATERIALS AND FINISHES

The materials and finishes shall be as specified herein. Where a definite material is not specified, a material which will enable the capacitors specified herein to meet the performance requirements of this specification shall be used. Acceptance or approval of any constituent material does not guarantee acceptance of the finished product.

4.4.1 Case
Tantalum, hermetically sealed.

4.4.2 Leads
The capacitors shall be equipped with electrically welded, solder-coated (Type '3' of ESCC Basic Specification No. 23500) nickel leads which shall be free from non-conductive and foreign materials.

4.4.3 Sleeving
Sleeving shall be of a non-fungus nutrient material (cardboard shall not be used). The material shall not soften, creep or shrink to the extent that it causes any part of the cylindrical case to become uncovered at any test temperature specified herein. At any cross-section, the maximum thickness of the sleeving shall not exceed twice the minimum thickness of the sleeves.

4.5 MARKING

4.5.1 General
The marking of all components delivered to this specification shall be in accordance with the requirements of ESCC Basic Specification No. 21700 and the following paragraphs.

These components being too small to accommodate the marking as specified hereafter, the marking information in full shall accompany each component in its primary package. Such marking shall comprise:

(a) The ESCC Component Number.
(b) Characteristics and Ratings.
(c) Traceability Information.

4.5.2 The ESCC Component Number
The SCC Component Number shall be constituted and marked as follows:

Example: 300300502B

- Detail Specification Number: 3003005
- Type Variant (see Figure 2): 02
- Testing Level (B or C, as applicable): B

4.5.3 Electrical Characteristics and Ratings
The electrical characteristics and ratings to be marked in the following order of precedence are:

(a) Capacitance Value.
(b) Tolerance.
(c) Rated Voltage.
(d) Polarity.

The information shall be constituted and marked as follows:

Example: 686KE

- Capacitance Value (68000000 pF) : 686
- Tolerance (±10%): K
- Rated Voltage (16V): E

4.5.3.1 Capacitance Value

The capacitance values shall be expressed by means of the following codes. The unit quantity for marking shall be picofarads.

Capacitance Value	Code
$XX10^5$	XX5
$XX10^6$	XX6
$XX10^7$	XX7
$XX10^8$	XX8
$XX10^9$	XX9

4.5.3.2 Tolerance

The tolerance on capacitance values shall be indicated by the letter codes specified hereafter.

Tolerance (%)	Code Letter
±10	K
±20	M

4.5.3.3 Rated Voltage

The rated voltage shall be indicated by the code letter specified hereafter.

Rated Voltage (V)	Code Letter
6	Z
6.3	A
8	C
10	D
15	G
16	E
25	F
30	H
40	J
50	K
60	M
63	L
75	P
100	Q
125	R

4.5.3.4 Polarity

Polarity shall be defined by a '+' on that end of the body of a capacitor where the positive lead protrudes.

4.5.4 Traceability Information

Traceability information shall be marked in accordance with the requirements of ESCC Basic Specification No. 21700.

4.6 ELECTRICAL MEASUREMENTS

4.6.1 Electrical Measurements at Room Temperature

The parameters to be measured at room temperature are scheduled in Table 2. The measurements shall be performed at T_{amb} = +22±3 °C.

4.6.2 Electrical Measurements at High and Low Temperatures

The parameters to be measured at high and low temperatures are scheduled in Table 3.

4.6.3 Circuits for Electrical Measurements (Figure 4)

Not applicable.

4.7 SELECTIVE LEVEL TESTING

4.7.1 Parameter Drift Values

The parameter drift values applicable to burn-in are specified in Table 4 of this specification. Unless otherwise stated, measurements shall be performed at T_{amb} = +22±3 ºC. The parameter drift values (Δ) applicable to the parameters scheduled shall not be exceeded. In addition to these drift value requirements for a given parameter, the appropriate limit value specified in Table 2 shall not be exceeded.

4.7.2 Conditions for Burn-in

The requirements for burn-in are specified in Section 7 of ESCC Generic Specification No. 3003. The conditions for burn-in shall be as specified in Table 5 of this specification. On completion of burn-in, a recovery period of 24 ± 2 hours is necessary before the end-measurements.

TABLE 2 - ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE

No.	Characteristics	Symbol	Spec. and/or Test Method	Test Conditions	Limits		Unit
					Min.	Max.	
1	DC Leakage	I_L	ESCC Gen. Spec. 3003	Para. 9.2.1.1	See Table 1(a)		µA
2	Capacitance Value	C	ESCC Gen. Spec. 3003	Para. 9.2.1.2	See Table 1(a)		µF
3	Dissipation Factor	DF	ESCC Gen. Spec. 3003	Para. 9.2.1.3	See Table 1(a)		%

NOTES

1. Measurements shall be made in the order shown. On completion of electrical measurements of Chart III and LAT3, all capacitors shall be discharged through 470Ω resistors for 5 seconds followed by short circuit for 2 minutes.

TABLE 3 - ELECTRICAL MEASUREMENTS AT HIGH AND LOW TEMPERATURES (NOTE 1)

Measurements shall be made in the order shown. Capacitors shall be brought to thermal stability before the measurements are made. Thermal stability will have been reached when no further change in capacitance is observed between 2 successive measurements made at 15 minute intervals.

No.	Characteristics	Symbol	Spec. and/or Test Method	Test Conditions	Limits		Unit
					Min.	Max.	
1 2 3	DC Leakage Capacitance Dissipation Factor (Note 2)	I_L C DF	ESCC Gen. Spec. 3003	+22±3 ºC	See Table 1(a)		µA µF %
4 5	Impedance Capacitance	Z C	ESCC Gen. Spec. 3003	-55 (+0 -5) ºC	See Table 1(a)		Ω µF
6 7 8	DC Leakage Capacitance Dissipation Factor (Note 2)	I_L C DF	ESCC Gen. Spec. 3003	+22±3 ºC	See Table 1(a)		µA µF %
9 10 11	DC Leakage Capacitance Dissipation Factor	I_L C DF	ESCC Gen. Spec. 3003	+85 (+3 -0) ºC	See Table 1(a)		µA µF %
12 13 14	DC Leakage (Note 3) Capacitance Dissipation Factor	I_L C DF	ESCC Gen. Spec. 3003	+125 (+5 -0) ºC	See Table 1(a)		µA µF %
15 16 17	DC Leakage Capacitance Dissipation Factor	I_L C DF	ESCC Gen. Spec. 3003	+22±3 ºC	See Table 1(a)		µA µF %

NOTES

1. Inspection Level II, single sampling, AQL = 2.5%, for each capacitance value. Each capacitance value shall be considered as constituting a complete lot.
2. Measurements 1, 2, 3 and 6, 7, 8 shall not be performed during burn-in.
3. Derated voltage shall be applied for this measurement.

TABLE 4 - PARAMETER DRIFT VALUES

No.	Characteristics	Symbol	Spec. and/or Test Method	Test Conditions	Change Limits (Δ)	Unit
1	DC Leakage Change	$\Delta I_L/I_L$	ESCC Gen. Spec. No. 3003 MIL-STD-202	Para. 9.2.1.1 Method 305	+200/-100% of measured value or + (25% + 0.05μA) (1) of limit value	
2	Capacitance Change	ΔC/C	ESCC Gen. Spec. No.3003	Para. 9.2.1.2	±5	%

NOTES
1. Whichever is smaller.
2. Leakage currents need not be recorded when less than, or equal to:
– 0.5μA for case sizes A and B.
– 0.8μA tor case size C.
– 1.4μA for case size D.

TABLE 5 - CONDITIONS FOR BURN-IN AND OPERATING LIFE TESTS

No.	Characteristic	Symbol	Condition	Unit
1	Ambient Temperature	T_{amb}	+85	°C
2	Test Voltage	U_R	Rated voltage (Note 1)	V

NOTES
1. See Table 1(a).

4.8 ENVIRONMENTAL AND ENDURANCE TESTS

4.8.1 Measurements and Inspections on Completion of Environmental Tests
The parameters to be measured on completion of environmental tests are scheduled in Table 6. Unless otherwise stated, the measurements shall be performed at T_{amb} = + 22 ± 3 °C.

4.8.2 Measurements and Inspections at Intermediate Points during Endurance Tests
The parameters to be measured at intermediate points during endurance tests are scheduled in Table 6.

4.8.3 Measurements and Inspections on Completion of Endurance Tests
The parameters to be measured on completion of endurance tests are scheduled in Table 6. Unless otherwise stated, the measurements shall be performed at T_{amb} = + 22 ± 3°C.

4.8.4 Conditions tor Operating Life Tests (Part of Endurance Testing)
The requirements tor operating lite testing are specified in Section 9 of ESCC Generic Specification No. 3003. The conditions tor operating lite testing shall be as specified in Table 5 of this specification.

TABLE 6 - MEASUREMENTS AND INSPECTIONS ON COMPLETION OF ENVIRONMENTAL TESTS AND AT INTERMEDIATE POINTS AND ON COMPLETION OF ENDURANCE TESTING

No.	ESCC Generic Spec. No. 3003		Measurements And Inspections		Symbol	Limits		Unit
	Environmental And Endurance Tests (1)	Test Method And Conditions	Identification	Conditions		Min.	Max.	
01	Rapid Change of Temperature	Para. 9.5	DC Leakage	Table 2, Item 1	I_L	2.5 x Limit Table 1(a)		
			Capacitance Change	Table 2, Item 2	ΔC/C	-15	+15	%
			Dissipation Factor	Table 2, Item 3	DF	1.5 x Limit Table 1(a)		
02	Vibration	Para. 9.6	Visual Inspection	-				
03	Shock	Para. 9.7	Visual Inspection	-				
04	Climatic Sequence	Para. 9.17	DC Leakage	Table 2, Item 1	I_L	2.5 x Limit Table 1(a)		
			Capacitance Change	Table 2, Item 2	ΔC/C	-15	+15	%
			Dissipation Factor	Table 2, Item 3	DF	1.5 x Limit Table 1(a)		
			Seal Test	Gen. 3003, Para. 9.1.2		Gen. 3003 Para. 9.1.2		
			Ext. Visual Inspection	Gen. 3003, Para. 9.3				
05	Solderability	Para. 9.8	Visual Inspection	-				
06	Robustness of Terminations	Para. 9.9	Visual Inspection	-				
07	Resistance to Soldering Heat	Para. 9.10	Visual Inspection	-				
08	Damp Heat, Steady State	Para. 9.11	DC Leakage	Table 2, Item 1	I_L	2.5 x Limit Table 1(a)		
			Capacitance Change	Table 2, Item 2	ΔC/C	-10	+10	%
			Dissipation Factor	Table 2, Item 3	DF	1.5 x Limit Table 1(a)		
			Insulation Resistance	Gen. 3003, Para. 9.2.1.4	Ri	100	-	MΩ
09	Cold Test	Para. 9.12	DC Leakage	Table 2, Item 1	I_L	2.5 x Limit Table 1(a)		
			Capacitance Change	Table 2, Item 2	ΔC/C	-5	+5	%
			Dissipation Factor	Table 2, Item 3	DF	1.5 x Limit Table 1(a)		
			Seal Test	Gen. 3003, Para. 9.1.2		Gen. 3003 Para. 9.1.2		
			Visual Inspection	Gen. 3003, Para. 9.3				
10	Low Air Pressure	Para. 9.13 U_R applied during last minute	Visual Inspection			No flash-over, arcing or signs of damage		
11	Surge Voltage	Para. 9.14	Visual Inspection					

No.	ESCC Generic Spec. No. 3003		Measurements And Inspections		Symbol	Limits		Unit
	Environmental And Endurance Tests (1)	Test Method And Conditions	Identification	Conditions		Min.	Max.	
12	Reverse Voltage	Para. 9.15	DC Leakage	Table 2, Item 1	I_L	2.5 x Limit Table 1(a)		
			Capacitance Change	Table 2, Item 2	ΔC/C	-15	+15	%
			Dissipation Factor	Table 2, Item 3	DF	1.5 x Limit Table 1(a)		
			Seal Test	Gen. 3003, Para. 9.1.2		Gen. 3003 Para. 9.1.2		
			Ext. Visual Inspection	Gen. 3003, Para. 9.3				
13	Life Test	Para. 9.16		At 500, 1000 & 2000 hours and after 24 hours recovery				
			DC Leakage	Table 2, Item 1	I_L	2.5 x Limit Table 1(a)		
			Capacitance Change	Table 2, Item 2	ΔC/C	-10	+10	%
			Dissipation Factor	Table 2, Item 3	DF	1.5 x Limit Table 1(a)		
			Insulation Resistance	Gen. 3003, Para. 9.2.1.4	Ri	100	-	MΩ
			Seal Test	Gen. 3003, Para. 9.1.2		Gen. 3003 Para. 9.1.2		
			Ext. Visual Inspection	Gen. 3003, Para. 9.3				
14	High and Low Temperature Measurements	Para. 9.2.3	Electrical Measurements	Table 3		Table 3		
15	Electrical Measurements	Para. 9.2.4	Electrical Measurements Ext. Visual Inspection	Table 2 Gen 3003, Para. 9.3		Table 2		

NOTES

1. The tests in this Table refer to either Chart IV or V and shall be used as applicable.