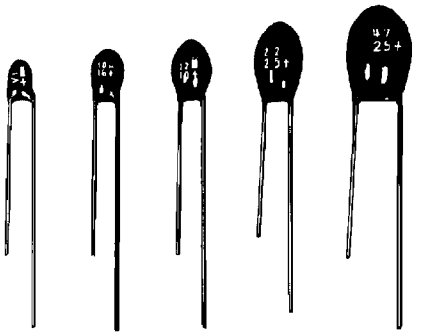
EF Series
Resin Dipped Tantalum



FEATURES

- **Endurance : 1 000h at +85°C with Voltage rating / at +105°C with voltage derating**
- **Operating Temperature : −40 to +105°C with voltage derating**
- **Taping for automatic insertion**

SPECIFICATIONS

<table>
<tr><th>Item</th><th>Performance Characteristics</th></tr>
<tr><td>Operating Temperature Range</td><td>
<table>
<tr><td>Operating Temperature</td><td>Conditions</td></tr>
<tr><td>-55°C to +105°C</td><td>Voltage derating for ratings ≥ 10V DC</td></tr>
<tr><td>-55°C to +85°C</td><td>Voltage rating</td></tr>
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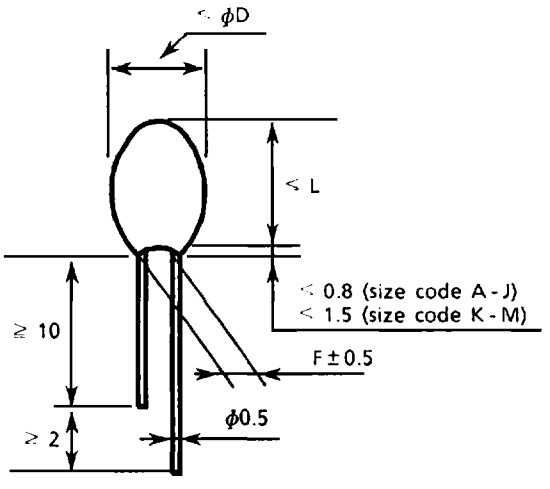
<tr><td>Rated Working Voltage Range</td><td>4V to 50V DC</td></tr>
<tr><td>Nominal Capacitance Range</td><td>0.047μF to 470μF (120Hz, +20°C)</td></tr>
<tr><td>Capacitance Tolerance</td><td>±20% or ±10% (120Hz, +20°C)</td></tr>
<tr><td>DC Leakage Current</td><td>I = 0.008C·V or 0.05 [μA] whichever is greater measured after a 2 minute application of rated working voltage at +20°C. (C = nominal capacitance in micro-farads, V = rated working voltage in volts)</td></tr>
<tr><td>Tangent of Loss Angle</td><td>Tan δ (120Hz, +20°C)
<table>
<tr><td>4V rating</td><td colspan="3">≤ 0.1</td></tr>
<tr><td rowspan="2">≥ 6.3V rating</td><td>≤ 1μF</td><td>>1μF - <100μF</td><td>≥ 100μF</td></tr>
<tr><td>≤ 0.04</td><td>≤ 0.06</td><td>≤ 0.08</td></tr>
</table>
</td></tr>
<tr><td>Rated and Derated Voltage</td><td>
<table>
<tr><td rowspan="2">Working voltage [V]</td><td>Rated</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td></tr>
<tr><td>Derated</td><td>8.1</td><td>13</td><td>20.5</td><td>28.5</td><td>41</td></tr>
</table>
</td></tr>
<tr><td>Surge Voltage</td><td>
<table>
<tr><td>Rated Working Voltage [V]</td><td>4</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td></tr>
<tr><td>Surge Voltage [V]</td><td>5</td><td>8</td><td>13</td><td>20</td><td>32</td><td>44</td><td>63</td></tr>
</table>
</td></tr>
<tr><td>Characteristics at High and Low Temperature</td><td>
<table>
<tr><td>−55°C</td><td>Capacitance change</td><td>≤ ±10% of initial measured value at +20°C</td></tr>
<tr><td rowspan="2">+85°C</td><td>Leakage Current</td><td>≤ 10 times of initial specified value</td></tr>
<tr><td>Capacitance change</td><td>≤ ±10% of initial measured value at +20°C</td></tr>
</table>
</td></tr>
</table>

SPECIFICATIONS (continued)

<table>
<tr><th>Item</th><th>Performance Characteristics</th></tr>
<tr><td>Moisture Resistance</td><td>
Test Conditions
<table>
<tr><td>Relative humidity</td><td>90% to 95%</td></tr>
<tr><td>Temperature</td><td>+40°C</td></tr>
<tr><td>Duration</td><td>500 h</td></tr>
</table>
Post test requirements at +20°C
<table>
<tr><td>Leakage current</td><td>≤ 0.012CV or 0.75 [μA] whichever is greater</td></tr>
<tr><td>Capacitance change</td><td>< ±10% of initial measured value</td></tr>
<tr><td>tan δ</td><td>≤ 150% of initial specified value</td></tr>
</table>
</td></tr>
<tr><td>Endurance</td><td>
Test conditions : either derating or rating
<table>
<tr><td>Item \ Conditions</td><td>Derating</td><td>Rating</td></tr>
<tr><td>Duration</td><td>1 000 h +48, −0 h</td><td>2 000 h +48, −0 h</td></tr>
<tr><td>Ambient temperature</td><td>+105°C ±2°C</td><td>+85°C ±2°C</td></tr>
<tr><td>Applied voltage</td><td>Derated working voltage</td><td>Rated working voltage</td></tr>
<tr><td>Source impedance</td><td>1Ω/V</td><td>1Ω/V</td></tr>
</table>
Post test requirements at +20°C
<table>
<tr><td>Leakage current</td><td>≤ 0.01C·V or 0.625 [μA]</td></tr>
<tr><td>Capacitance change</td><td>≤ ±10% of initial measured value</td></tr>
<tr><td>tan δ</td><td>≤ Initial specified value</td></tr>
</table>
</td></tr>
</table>

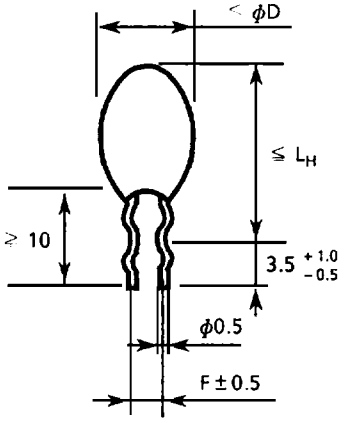
Dimensions

■Straight Leads



Size Code	φD	L	F
A	3.3	5.0	2.5±0.5
B	3.3	5.5	2.5±0.5
C	3.5	5.5	2.5±0.5
D	3.7	6.5	2.5±0.5
E	4.0	7.0	2.5+1.0,−0.5
F	4.5	7.0	2.5+1.0,−0.5
G	4.7	8.0	2.5+1.0,−0.5
H	5.2	8.5	2.5+1.0,−0.5
I	5.5	9.5	2.5+1.0,−0.5
J	6.0	11.0	2.5+1.0,−0.5
K	7.5	12.5	5.0±0.5
L	9.0	14.5	5.0±0.5
M	10.0	15.5	5.0±0.5

■Snap-in Leads (Not standard)



Size Code	φD	L_H	F
A	4.5	10.0	5.0±0.5
B	4.5	10.5	5.0±0.5
C	4.5	10.5	5.0±0.5
D	5.0	11.5	5.0±0.5
E	5.5	12.0	5.0±0.5
F	5.5	12.0	5.0±0.5
G	6.0	13.0	5.0±0.5
H	6.0	13.5	5.0±0.5
I	7.0	14.5	5.0±0.5
J	7.5	16.0	5.0±0.5

PART NUMBER SYSTEM

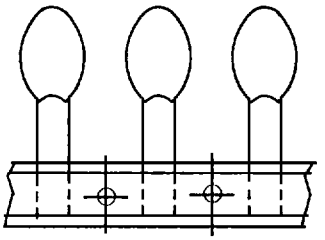
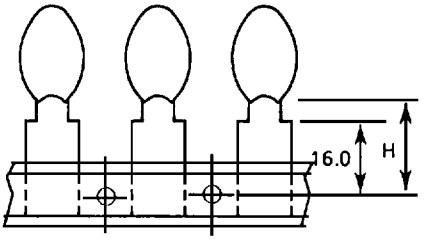
E C S F □ □ E □ □ □ □ □

W.V. Code			
Code	W. V.	Code	W. V.
0G	4V	1E	25V
0J	6.3V	1V	35V
1A	10V	1H	50V
1C	16V	–	–

Capacitance Code in pF	
First two digits	Significant figures
Third digit	Number of zeros to follow

Cap. Tol. Code	
(None)	±20%
K	±10%

※ Not standard

Suffix for Configuration		
Suffix	Configuration	Packaging
(none)	Long lead	Bulk
※E	Snap-in leads	Bulk
※B1	Taping 	Fan fold box Quantity : 2 000 pcs / box
※BB	Taping  **For new design,** it is recommended to select suffix BB.	Fan fold box Quantity : 2 000 pcs / box
※B		

Lead spacing	Size code
2.5mm	A-I

Suffix	Lead spacing	Dim. H	Size code
BB	5mm	18.5mm	A-I
B	5mm	21.5mm	A-I

STANDARD PRODUCTS TABLE

Rated DC Working Voltage [V]	Nominal Capacitance (120Hz, +20°C) [μF]	Part Number	Size Code	Leakage Current : ≤ (+20°C) [μF]
4	6.8	ECSF0GE685K	C	0.3
	10	ECSF0GE106K	C	0.4
	15	ECSF0GE156K	D	0.5
	22	ECSF0GE226K	E	0.8
	33	ECSF0GE336K	F	1.1
	47	ECSF0GE476K	G	1.6
	68	ECSF0GE686	H	2.2
	100	ECSF0GE107	I	3.2
	150	ECSF0GE157	J	4.8
	220	ECSF0GE227	K	7.1
	330	ECSF0GE337	L	10.6
	470	ECSF0GE477	M	15.1
6.3	4.7	ECSF0JE475K	C	0.3
	6.8	ECSF0JE685K	C	0.4
	10	ECSF0JE106K	D	0.6
	15	ECSF0JE156K	E	0.8
	22	ECSF0JE226K	F	1.2
	33	ECSF0JE336K	G	1.7
	47	ECSF0JE476	H	2.4
	68	ECSF0JE686	I	3.5
	100	ECSF0JE107	J	5.1
	150	ECSF0JE157	K	7.6
	220	ECSF0JE227	L	11.1
	330	ECSF0JE337	M	16.7
10	2.2	ECSF1AE225K	B	0.2
	3.3	ECSF1AE335K	C	0.3
	4.7	ECSF1AE475K	C	0.4
	6.8	ECSF1AE685K	D	0.6
	10	ECSF1AE106K	E	0.8
	15	ECSF1AE156K	F	1.2
	22	ECSF1AE226K	G	1.8
	33	ECSF1AE336K	H	2.7
	47	ECSF1AE476K	I	3.8
	68	ECSF1AE686	J	5.5
	100	ECSF1AE107	K	8.0
	150	ECSF1AE157	L	12.0
	220	ECSF1AE227	M	17.6

STANDARD PRODUCTS TABLE

Rated DC Working Voltage [V]	Nominal Capacitance (120Hz, +20°C) [μF]	Part Number	Size Code	Leakage Current : ≤ (+20°C) [μA]
16	1	ECSF1CE105K	A	0.2
	1.5	ECSF1CE155K	B	0.2
	2.2	ECSF1CE225K	C	0.3
	3.3	ECSF1CE335K	C	0.5
	4.7	ECSF1CE475K	D	0.7
	6.8	ECSF1CE685K	E	0.9
	10	ECSF1CE106K	F	1.3
	15	ECSF1CE156K	G	2.0
	22	ECSF1CE226K	H	2.9
	33	ECSF1CE336K	I	4.3
	47	ECSF1CE476	J	6.1
	68	ECSF1CE686	K	8.8
	100	ECSF1CE107	L	12.8
	150	ECSF1CE157	M	19.2
25	1.5	ECSF1EE155K	C	0.3
	2.2	ECSF1EE225K	C	0.5
	3.3	ECSF1EE335K	D	0.7
	4.7	ECSF1EE475K	E	1.0
	6.8	ECSF1EE685K	F	1.4
	10	ECSF1EE106K	H	2.0
	15	ECSF1EE156K	I	3.0
	22	ECSF1EE226	J	4.4
	33	ECSF1EE336	K	6.6
	47	ECSF1EE476	L	9.4
	68	ECSF1EE686	M	13.6

STANDARD PRODUCTS TABLE

Rated DC Working Voltage [V]	Nominal Capacitance (120Hz, +20°C) [μF]	Part Number	Size Code	Leakage Current : ≤ (+20°C) [μA]
35	0.047	ECSF1VE473	A	0.05
	0.068	ECSF1VE683	A	0.05
	0.1	ECSF1VE104	A	0.05
	0.15	ECSF1VE154	A	0.05
	0.22	ECSF1VE224	A	0.07
	0.33	ECSF1VE334	A	0.1
	0.47	ECSF1VE474	B	0.2
	0.68	ECSF1VE684	B	0.2
	1	ECSF1VE105K	C	0.3
	1.5	ECSF1VE155K	C	0.5
	2.2	ECSF1VE225K	D	0.7
	3.3	ECSF1VE335K	E	1.0
	4.7	ECSF1VE475K	F	1.4
	6.8	ECSF1VE685K	H	2.0
	10	ECSF1VE106K	I	2.8
	15	ECSF1VE156	J	4.2
	22	ECSF1VE226	K	6.2
	33	ECSF1VE336	L	9.3
	47	ECSF1VE476	M	13.2
50	0.1	ECSF1HE104	A	0.05
	0.15	ECSF1HE154	A	0.06
	0.22	ECSF1HE224	B	0.09
	0.33	ECSF1HE334	C	0.2
	0.47	ECSF1HE474	D	0.2
	0.68	ECSF1HE684	D	0.3
	1	ECSF1HE105K	E	0.4
	1.5	ECSF1HE155K	F	0.6
	2.2	ECSF1HE225K	G	0.9
	3.3	ECSF1HE335K	H	1.4
	4.7	ECSF1HE475K	I	1.9
	6.8	ECSF1HE685	K	2.8
	10	ECSF1HE106	L	4.0
	15	ECSF1HE156	M	6.0