

## Aluminum Electrolytic Capacitors

## TUP/TSP

### TUP/TSP Series

#### Key Features

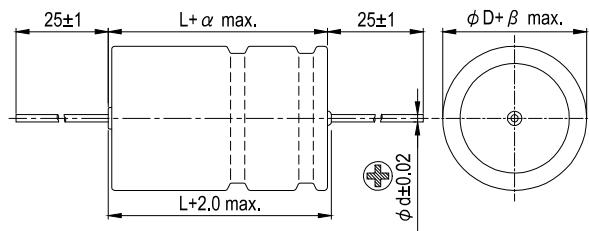
- High vibration resistance
- High ripple current capability
- Low ESR
- Useful Life 2,000 hours at 150°C
- Shelf life up to 15 years at a storage temperature of 30°C
- RoHS compliance

#### Specifications

Rated Voltage $V_R$	25 ~ 63 V <sub>DC</sub>	
Surge Voltage $V_S$	1.15 · $V_R$	
Rated Capacitance $C_R$	360 ~ 4,500 $\mu$ F	at 100 Hz, 20°C
Capacitance Tolerance	-10% ~ +30%	
Leakage Current $I_{leak}$ (at 20°C)	$I_{leak} \leq 0.006\mu A \cdot CV + 4\mu A$ C = Rated capacitance in $\mu$ F, V = Rated DC working voltage in V	
Useful Life 125°C: $V_R, I_{AC, R}$ 150°C: $V_R, 0.5 \cdot I_{AC, R}$	10,000 Hrs 2,000 Hrs	Requirements: Cap.: Within $\pm$ 30% of initial value ESR: Within 300% of specified value $I_{leak}$ : Within initial specified limit
Voltage Endurance Test 125°C: $V_R$	4,000 Hrs for $V_R \leq 40V$ DC 3,000 Hrs for $V_R = 63V$ DC	Requirements: Cap.: Within $\pm$ 10% of initial value ESR: Within 130% of specified value $I_{leak}$ : Within initial specified limit
Vibration Resistance	The wires of the Axial-Lead capacitor should be mounted at a distance of (6 $\pm$ 1) mm from its body, which is additionally clamped. Soldering star capacitors should be mounted in a upright position and its terminals should be firmly soldered to the PCB and body additionally clamped. Vibration test according to IEC 60068-2-6, test Fc: Frequency range 10 Hz ~ 2 KHz, max. displacement amplitude 1.5 mm, max. acceleration 20 g, in total 6 hours(3*2 hours).	
Detail Specification Sectional Specification	Similar to CECC 30301-802 IEC 60384-4	

#### Product Dimensions

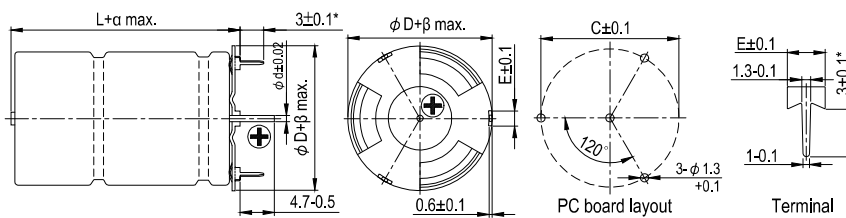
##### TUP Series



Unit: mm

$\phi D$	16	18	21
$\phi d$	1.0		
$\alpha$	0.5		
$\beta$	0.5		

##### TSP Series



Unit: mm

$\phi D$	16	18	21
C	16.5	18.5	21.5
E	3.1		3.6
$\phi d$	1.0		
$\alpha$	2.5		
$\beta$	1.2		



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### Characteristics and Permissible Ripple Current

Working Voltage (V <sub>DC</sub> )	Capacitance 100 Hz, 20°C (μF)	φD×L (mm)	ESR <sub>max</sub> 100 Hz, 20°C (Ω)	ESR <sub>max</sub> 10k Hz, 20°C (Ω)	Imp. <sub>max</sub> 100k Hz, 20°C (Ω)	I <sub>AC, R</sub> 10k Hz, 125°C (A <sub>rms</sub> )	I <sub>AC, max</sub> 10k Hz, 150°C (A <sub>rms</sub> )	Axial-lead Part Number	Soldering star Part Number
<b>25</b>	1,000	16 × 25	0.098	0.053	0.050	3.6	1.8	TUP102Q1EAL-1625S	TSP102Q1ESS-1625S
	1,200	18 × 25	0.080	0.043	0.041	4.4	2.2	TUP122Q1EAL-1825S	TSP122Q1ESS-1825S
	1,300	16 × 30	0.075	0.041	0.039	4.5	2.2	TUP132Q1EAL-1630S	TSP132Q1ESS-1630S
	1,500	16 × 35	0.065	0.035	0.034	5.2	2.6	TUP152Q1EAL-1635S	TSP152Q1ESS-1635S
	1,700	18 × 30	0.057	0.031	0.029	5.5	2.7	TUP172Q1EAL-1830S	TSP172Q1ESS-1830S
	1,800	16 × 39	0.055	0.030	0.028	5.9	2.9	TUP182Q1EAL-1639S	TSP182Q1ESS-1639S
	2,200	18 × 39	0.044	0.024	0.023	7.2	3.6	TUP222Q1EAL-1839S	TSP222Q1ESS-1839S
	3,300	21 × 39	0.031	0.017	0.016	8.3	4.1	TUP332Q1EAL-2139S	TSP332Q1ESS-2139S
4,500	21 × 49	0.023	0.013	0.012	10.4	5.2	TUP452Q1EAL-2149S	TSP452Q1ESS-2149S	
<b>40</b>	560	16 × 25	0.129	0.053	0.050	3.6	1.8	TUP561Q1GAL-1625S	TSP561Q1GSS-1625S
	680	18 × 25	0.105	0.043	0.041	4.4	2.2	TUP681Q1GAL-1825S	TSP681Q1GSS-1825S
	720	16 × 30	0.100	0.042	0.039	4.5	2.2	TUP721Q1GAL-1630S	TSP721Q1GSS-1630S
	820	16 × 35	0.088	0.036	0.034	5.2	2.6	TUP821Q1GAL-1635S	TSP821Q1GSS-1635S
	900	18 × 30	0.080	0.033	0.031	5.4	2.7	TUP901Q1GAL-1830S	TSP901Q1GSS-1830S
	1,000	16 × 39	0.073	0.030	0.029	5.9	2.9	TUP102Q1GAL-1639S	TSP102Q1GSS-1639S
	1,400	18 × 39	0.052	0.022	0.020	7.4	3.7	TUP142Q1GAL-1839S	TSP142Q1GSS-1839S
	2,000	21 × 39	0.038	0.016	0.016	8.4	4.2	TUP202Q1GAL-2139S	TSP202Q1GSS-2139S
2,700	21 × 49	0.028	0.012	0.012	10.5	5.2	TUP272Q1GAL-2149S	TSP272Q1GSS-2149S	
<b>63</b>	360	16 × 25	0.173	0.058	0.055	2.6	1.3	TUP361Q1JAL-1625S	TSP361Q1JSS-1625S
	470	18 × 25	0.132	0.043	0.041	3.3	1.6	TUP471Q1JAL-1825S	TSP471Q1JSS-1825S
	510	16 × 30	0.124	0.042	0.040	3.4	1.7	TUP511Q1JAL-1630S	TSP511Q1JSS-1630S
	620	16 × 35	0.102	0.034	0.033	4.0	2.0	TUP621Q1JAL-1635S	TSP621Q1JSS-1635S
	620	18 × 30	0.100	0.033	0.032	4.1	2.0	TUP621Q1JAL-1830S	TSP621Q1JSS-1830S
	750	16 × 39	0.084	0.029	0.027	4.5	2.2	TUP751Q1JAL-1639S	TSP751Q1JSS-1639S
	820	18 × 35	0.076	0.026	0.024	5.0	2.5	TUP821Q1JAL-1835S	TSP821Q1JSS-1835S
	910	18 × 39	0.069	0.023	0.022	5.5	2.7	TUP911Q1JAL-1839S	TSP911Q1JSS-1839S
	910	21 × 30	0.071	0.025	0.024	4.8	2.4	TUP911Q1JAL-2130S	TSP911Q1JSS-2130S
	1,100	21 × 35	0.058	0.021	0.020	5.6	2.8	TUP112Q1JAL-2135S	TSP112Q1JSS-2135S
	1,300	21 × 39	0.050	0.018	0.017	6.4	3.2	TUP132Q1JAL-2139S	TSP132Q1JSS-2139S
	1,800	21 × 49	0.036	0.013	0.013	8.0	4.0	TUP182Q1JAL-2149S	TSP182Q1JSS-2149S

### Part Numbering System

TUP series 1,000 μF -10% ~ +30% 40V Axial-lead 16 φ × 39L

**TUP**    **102**    **Q**    **1G**    **—**    **=**    **1639**    **S**

Series name    Capacitance    Capacitance tolerance    Rated voltage    Lead forming    Sealing type    Case size    Regional Code

Note: Please refer to "Part Numbering System" section on page 1 for more details.

## Product Guide

### Selection Chart

<b>TUR / TSR</b> -40 ~ +125°C High Ripple Current 125°C, 3,000 Hrs	<b>TUK / TSK</b> -40 ~ +125°C Long Life Time 125°C, 5,000 Hrs 140°C, 2,000 Hrs	<b>TUP / TSP</b> -40 ~ +150°C High Temperature 125°C, 10,000 Hrs 150°C, 2,000 Hrs
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### Capacitor Series Table

Series	Highlights	Temperature	Rated Voltage Range (V, DC)	Capacitance Range (µF)	Page
TUR / TSR	High Ripple Current	-40 ~ 125°C	25 ~ 40	1,400 ~ 10,000	3 ~ 4
TUK / TSK	High Reliability, Long Lifetime	-40 ~ 125°C	25 ~ 100	220 ~ 10,000	5 ~ 6
TUP / TSP	High Temperature	-40 ~ 150°C	25 ~ 63	360 ~ 4,500	7 ~ 8

### Part Numbering System

#### Product Code Guide

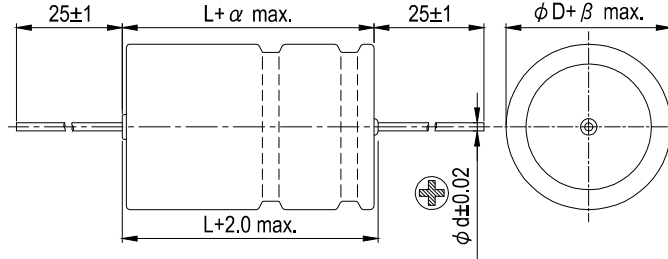
Digit	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Example:	T	U	R	1	7	2	Q	1	E	A	L	-	1	8	3	0		

Digit	Description																										
1 ~ 3	Series Name When the series name is represented by only two letters, a hyphen, "-", is used to fill the third space.																										
4 ~ 6	Capacitance <table border="1"> <tr> <td>Capacitance</td> <td>220</td><td>300</td><td>700</td><td>1,000</td><td>4,700</td><td>5,600</td><td>10,000</td> </tr> <tr> <td>Code</td> <td>221</td><td>301</td><td>701</td><td>102</td><td>472</td><td>562</td><td>103</td> </tr> </table>	Capacitance	220	300	700	1,000	4,700	5,600	10,000	Code	221	301	701	102	472	562	103										
Capacitance	220	300	700	1,000	4,700	5,600	10,000																				
Code	221	301	701	102	472	562	103																				
7	Capacitance Tolerance <table border="1"> <tr> <td>Tolerance</td> <td>K</td><td>M</td><td>N</td><td>Q</td> </tr> <tr> <td>Code</td> <td>±10%</td><td>±20%</td><td>±30%</td><td>-10 ~ +30%</td> </tr> </table>	Tolerance	K	M	N	Q	Code	±10%	±20%	±30%	-10 ~ +30%																
Tolerance	K	M	N	Q																							
Code	±10%	±20%	±30%	-10 ~ +30%																							
8 ~ 9	Rated Voltage <table border="1"> <tr> <td>Voltage (WV)</td> <td>25</td><td>35</td><td>40</td><td>50</td><td>63</td><td>75</td><td>100</td> </tr> <tr> <td>Code</td> <td>1E</td><td>1V</td><td>1G</td><td>1H</td><td>1J</td><td>1R</td><td>2A</td> </tr> </table>	Voltage (WV)	25	35	40	50	63	75	100	Code	1E	1V	1G	1H	1J	1R	2A										
Voltage (WV)	25	35	40	50	63	75	100																				
Code	1E	1V	1G	1H	1J	1R	2A																				
10 ~ 11	Lead Forming <table border="1"> <tr> <td>AL</td><td>SS</td><td>PP</td> </tr> <tr> <td>Axial-lead,</td><td>Soldering star</td><td>Two plate</td> </tr> </table>	AL	SS	PP	Axial-lead,	Soldering star	Two plate																				
AL	SS	PP																									
Axial-lead,	Soldering star	Two plate																									
12	Sealing Type - : Standard																										
13 ~ 16	Case Size <table border="1"> <tr> <td>φ D×L</td> <td>16×25</td><td>16×30</td><td>16×35</td><td>16×39</td><td>18×25</td><td>18×30</td><td>18×35</td><td>18×39</td><td>21×30</td><td>21×35</td><td>21×39</td><td>21×49</td> </tr> <tr> <td>Code</td> <td>1625</td><td>1630</td><td>1635</td><td>1639</td><td>1825</td><td>1830</td><td>1835</td><td>1839</td><td>2130</td><td>2135</td><td>2139</td><td>2149</td> </tr> </table>	φ D×L	16×25	16×30	16×35	16×39	18×25	18×30	18×35	18×39	21×30	21×35	21×39	21×49	Code	1625	1630	1635	1639	1825	1830	1835	1839	2130	2135	2139	2149
φ D×L	16×25	16×30	16×35	16×39	18×25	18×30	18×35	18×39	21×30	21×35	21×39	21×49															
Code	1625	1630	1635	1639	1825	1830	1835	1839	2130	2135	2139	2149															
17	Lead Wire and Marking Type																										
18	Supplement Code: For special control purposes																										

## Product Guide

### Dimensional and Lead Forming Drawings

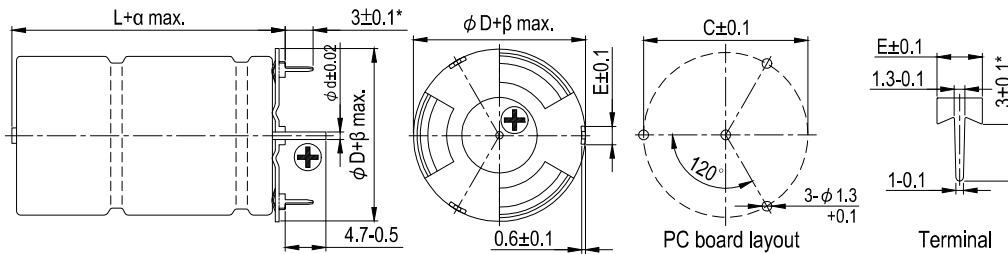
Axial-lead capacitors



Dimensions and packing units

$\phi D \times L$ mm	$\phi D + \beta$ (max.) $\times L + \alpha$ (max.) mm	$\phi d$ mm	Q'ty / Tray pcs	Q'ty / Box pcs
16 × 25	16.5 × 25.5	1.0	45	315
16 × 30	16.5 × 30.5	1.0	45	315
16 × 35	16.5 × 35.5	1.0	45	315
16 × 39	16.5 × 39.5	1.0	45	315
18 × 25	18.5 × 25.5	1.0	45	315
18 × 30	18.5 × 30.5	1.0	45	315
18 × 35	18.5 × 35.5	1.0	45	315
18 × 39	18.5 × 39.5	1.0	45	315
21 × 30	21.5 × 30.5	1.0	45	270
21 × 35	21.5 × 35.5	1.0	45	270
21 × 39	21.5 × 39.5	1.0	45	270
21 × 49	21.5 × 49.5	1.0	35	210

Soldering star capacitors



Dimensions and packing units

$\phi D \times L$ mm	$\phi D + \beta$ (max.) $\times L + \alpha$ (max.) mm	$\phi d$ mm	$C \pm 0.1$ mm	$E \pm 0.1$ mm	Q'ty / Tray pcs	Q'ty / Box pcs
16 × 25	17.2 × 27.5	1.0	16.5	3.1	45	315
16 × 30	17.2 × 32.5	1.0	16.5	3.1	45	315
16 × 35	17.2 × 37.5	1.0	16.5	3.1	45	315
16 × 39	17.2 × 41.5	1.0	16.5	3.1	35	245
18 × 25	19.2 × 27.5	1.0	18.5	3.1	45	315
18 × 30	19.2 × 32.5	1.0	18.5	3.1	45	315
18 × 35	19.2 × 37.5	1.0	18.5	3.1	45	315
18 × 39	19.2 × 41.5	1.0	18.5	3.1	35	245
21 × 30	22.2 × 32.5	1.0	21.5	3.6	45	270
21 × 35	22.2 × 37.5	1.0	21.5	3.6	45	270
21 × 39	22.2 × 41.5	1.0	21.5	3.6	35	210
21 × 49	22.2 × 51.5	1.0	21.5	3.6	35	210