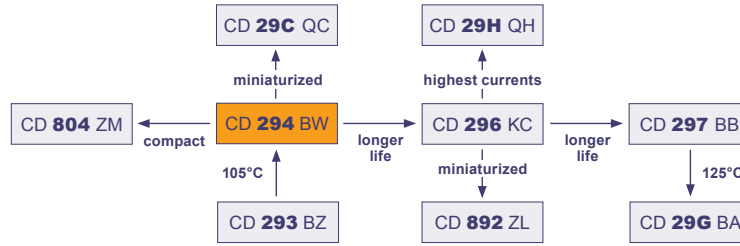


# CD 294 BW Series



4000h at 105°C

- Standard 105°C
- General Industry



Item	Characteristics	
Operating Temperature Range (°C)	-40 ~ +105	-25 ~ +105
Voltage Range (V)	16 ~ 100	160 ~ 500
Capacitance Range (µF)	39 ~ 47 000	
Capacitance Tolerance (20°C, 120Hz)	± 20%	
Leakage Current (µA)	After 5 minutes at 20°C application of rated voltage, leakage current is not more than 0,01CV or 1,5mA, whichever is smaller C: Nominal Capacitance (µF) V: Rated Voltage (V)	
Dissipation Factor (20°C, 120Hz)	<b>Rated Voltage (V)</b>	<b>16</b> <b>25</b> <b>35</b> <b>50</b> <b>63~100</b> <b>160~400</b> <b>450~500</b>
	<b>Tan δ (max)</b>	0,50    0,40    0,35    0,30    0,20    0,15    0,20
Stability at Low Temperature (Impedance Ratio at 120Hz)	<b>Rated Voltage (V)</b>	<b>16~100</b> <b>160~200</b> <b>250~500</b>
	$Z_{-25°C} / Z_{+20°C}$	4
	$Z_{-40°C} / Z_{+20°C}$	15

	Useful Life		Load Life	Endurance Test	Shelf Life
Lifetime	<b>4 000h</b>	>180 000h	2 000h	3 000h	1 000h
Leakage Current	Not more than specified value		Not more than specified value	Not more than specified value	Not more than specified value
Capacitance Change	Within ± 30% of initial value		Within ± 20% of initial value	Within ± 20% of initial value	Within ± 20% of initial value
Dissipation Factor	Not more than 300% of specified value		Not more than 200% of specified value	Not more than 200% of specified value	Not more than 200% of specified value
Condition:					
Applied Voltage	$U_R$	$U_R$	$U_R$	$U_R$	$U_R = 0$
Applied Current	$I_R$	$1,4 \times I_R$	$I_R$	$I_R = 0$	$I_R = 0$
Applied Temperature	105°C	40°C	105°C	105°C	105°C
Outlier Percentage	≤ 1%	≤ 1%	0%	IEC 60384	0%
					After test: $U_R$ to be applied for 30min >24h before measurement

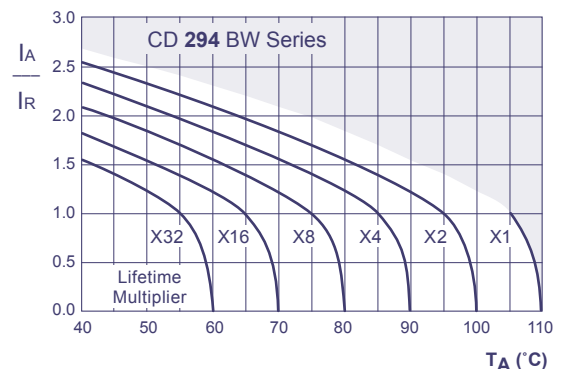
## Multiplier for Ripple Current

Frequency Coefficient

Rated Voltage (V)	Frequency					
	50Hz	120Hz	300Hz	1kHz	10kHz	≥ 50kHz
≤ 100	0,95	1,00	1,07	1,13	1,19	1,20
160 ~ 250	0,87	1,00	1,17	1,32	1,45	1,50
≥ 350	0,80	1,00	1,16	1,30	1,41	1,43

## Multiplier for Lifetime

Lifetime Diagram



$I_A$  = actual ripple current at 120Hz,  $I_R$  = rated ripple current at 120Hz, 105°C  
Multiplier of Useful Life as a function of ambient temperature and ripple current load

Snap-In

## Ratings for CD 294 BW Series

U <sub>R,DC</sub> (Surge Voltage) Code	Rated Capacitance	Max ESR 20°C, 120Hz	Typ ESR 20°C, 120Hz	Max Ripple Current 105°C, 120Hz	Size Ø D x L	
(V)	(µF)	(mΩ)	(mΩ)	(Arms)	(mm)	
<b>16 (20) 1C</b>	6800	98	69	1,60	22 x 25	
		67	47	1,99	22 x 30	
	10000	67	47	1,99	25 x 25	
		56	39	2,28	22 x 35	
	12000	56	39	2,30	25 x 30	
		56	39	2,38	30 x 25	
	15000	45	31	2,64	22 x 40	
		45	31	2,68	25 x 35	
	18000	37	26	2,98	22 x 45	
		37	26	3,04	25 x 40	
		37	26	3,00	30 x 30	
		37	26	3,10	35 x 25	
		31	22	3,40	25 x 45	
	22000	31	22	3,39	30 x 35	
		25	18	3,81	25 x 50	
	27000	25	18	3,83	30 x 40	
		25	18	3,74	35 x 30	
		21	15	4,30	30 x 45	
33000	21	15	4,24	35 x 35		
	18	12	4,74	30 x 50		
39000	18	12	4,72	35 x 40		
	15	10	5,27	35 x 45		
<b>25 (32) 1E</b>	4700	113	80	1,55	22 x 25	
		79	55	1,91	22 x 30	
	6800	79	55	1,91	25 x 25	
		65	46	2,14	22 x 35	
	8200	65	46	2,16	25 x 30	
		65	46	2,25	30 x 25	
	10000	54	38	2,40	22 x 40	
		54	38	2,44	25 x 35	
	12000	45	31	2,69	22 x 45	
		45	31	2,74	25 x 40	
		45	31	2,70	30 x 30	
	15000	45	31	2,80	35 x 25	
		36	25	3,15	25 x 45	
	18000	36	25	3,13	30 x 35	
		36	25	3,22	35 x 30	
	22000	30	21	3,54	25 x 50	
		30	21	3,54	30 x 40	
	27000	25	17	4,24	30 x 45	
		25	17	3,96	35 x 35	
	33000	20	14	4,75	35 x 45	
		17	12	5,39	35 x 50	
	<b>35 (44) 1V</b>	3300	141	99	1,43	22 x 25
			120	84	1,65	22 x 30
		3900	99	70	1,78	25 x 25
83			59	2,02	22 x 35	
5600		83	59	2,04	25 x 30	
		83	59	2,12	30 x 25	
6800		69	48	2,28	22 x 40	
		69	48	2,31	25 x 35	
8200		57	40	2,67	22 x 50	
		57	40	2,60	25 x 40	
		57	40	2,56	30 x 30	
10000		57	40	2,78	35 x 25	
		47	33	2,92	25 x 45	
12000		47	33	2,92	30 x 35	
		39	28	3,26	25 x 50	
15000		39	28	3,28	30 x 40	
		39	28	3,20	35 x 30	
18000		31	22	3,74	30 x 45	
		31	22	3,69	35 x 35	
22000		26	19	4,16	35 x 40	
		22	15	4,92	35 x 50	
<b>50 (63) 1H</b>		1800	222	155	1,31	22 x 25
			181	127	1,45	22 x 30
		2200	148	104	1,70	22 x 30
	148		104	1,70	25 x 25	
	3300	121	85	1,98	22 x 35	
		121	85	2,00	25 x 30	
	3900	103	72	2,25	22 x 40	
		103	72	2,28	25 x 35	
	4700	103	72	2,22	30 x 25	
		85	60	2,56	22 x 45	
	5600	85	60	2,58	30 x 30	
		85	60	2,67	35 x 25	
	6800	72	50	2,89	22 x 50	
		72	50	2,81	25 x 40	
		72	50	2,95	30 x 35	
		59	41	3,37	25 x 50	
		59	41	3,39	30 x 40	
		59	41	3,31	35 x 30	

U <sub>R,DC</sub> (Surge Voltage) Code	Rated Capacitance	Max ESR 20°C, 120Hz	Typ ESR 20°C, 120Hz	Max Ripple Current 105°C, 120Hz	Size Ø D x L
(V)	(µF)	(mΩ)	(mΩ)	(Arms)	(mm)
<b>50 (63) 1H</b>	8200	49	34	3,71	30 x 45
		49	34	3,66	35 x 35
	10000	40	28	4,09	30 x 50
		40	28	4,07	35 x 40
	12000	34	24	4,50	35 x 45
		222	155	1,25	22 x 25
	1800	148	104	1,52	22 x 30
		148	104	1,52	25 x 25
	2200	121	85	1,73	22 x 35
		121	85	1,75	25 x 30
	2700	99	69	1,97	22 x 40
		99	69	1,99	25 x 35
	99	69	1,93	30 x 25	
	81	57	2,32	22 x 50	
3300	81	57	2,27	25 x 40	
	81	57	2,24	30 x 30	
	81	57	2,41	35 x 25	
3900	68	48	2,54	25 x 45	
	68	48	2,55	30 x 35	
4700	57	40	2,88	25 x 50	
	57	40	2,90	30 x 40	
	57	40	2,83	35 x 30	
	48	34	3,28	30 x 45	
5600	48	34	3,24	35 x 35	
	40	28	3,73	30 x 50	
6800	40	28	3,71	35 x 40	
	33	23	4,16	35 x 45	
8200	27	19	4,69	35 x 50	
	820	324	227	1,11	22 x 25
1000	266	186	1,25	22 x 25	
	222	155	1,39	22 x 30	
1200	222	155	1,39	25 x 25	
	177	124	1,61	22 x 35	
1500	177	124	1,62	25 x 30	
	148	104	1,83	22 x 40	
1800	148	104	1,81	30 x 25	
	121	85	2,09	22 x 45	
2200	121	85	2,01	25 x 35	
	121	85	2,10	30 x 30	
	121	85	2,17	35 x 25	
	99	69	2,43	25 x 45	
2700	99	69	2,43	30 x 35	
	81	57	2,76	25 x 50	
3300	81	57	2,78	30 x 40	
	81	57	2,71	35 x 30	
3900	69	48	3,12	30 x 45	
	69	48	3,07	35 x 35	
4700	57	40	3,56	30 x 50	
	57	40	3,50	35 x 40	
5600	48	34	3,87	35 x 45	
	40	28	4,19	35 x 50	
6800	474	332	1,07	22 x 25	
	324	227	1,35	22 x 30	
820	324	227	1,35	25 x 25	
	266	186	1,54	22 x 35	
1000	266	186	1,56	25 x 30	
	222	155	1,74	22 x 40	
1200	222	155	1,76	25 x 35	
	222	155	1,71	30 x 25	
1500	177	124	1,99	22 x 45	
	177	124	2,03	25 x 40	
	177	124	2,00	30 x 30	
	177	124	2,07	35 x 25	
1800	148	104	2,28	25 x 45	
	148	104	2,27	30 x 35	
2200	121	85	2,57	25 x 50	
	121	85	2,59	30 x 40	
	121	85	2,52	35 x 30	
	99	69	2,94	30 x 45	
2700	99	69	2,90	35 x 35	
	81	57	3,32	30 x 50	
3300	81	57	3,31	35 x 40	
	69	48	3,69	35 x 45	
3900	57	40	4,14	35 x 50	
	330	603	423	1,16	22 x 25
160 (200) 2C	390	511	358	1,43	22 x 30
	470	424	297	1,52	22 x 35
	470	424	297	1,55	25 x 25
	560	356	249	1,62	22 x 40
	560	356	249	1,73	25 x 30

Snap-In

Customer specific products and adaptations on request.

## Ratings for CD 294 BW Series

U <sub>R,DC</sub> (Surge Voltage) Code	Rated Capacitance	Max ESR 20°C, 120Hz	Typ ESR 20°C, 120Hz	Max Ripple Current 105°C, 120Hz	Size Ø D x L	
(V)	(µF)	(mΩ)	(mΩ)	(Arms)	(mm)	
<b>160 (200) 2C</b>	680	293	205	1,70	22 x 45	
		293	205	1,81	25 x 35	
		293	205	1,82	30 x 25	
	820	243	170	1,81	22 x 50	
		243	170	1,98	25 x 40	
		243	170	1,98	30 x 30	
	1000	243	170	1,93	35 x 25	
		199	140	2,04	25 x 45	
		199	140	2,14	30 x 35	
	1200	166	117	2,12	25 x 50	
		166	117	2,22	30 x 40	
		166	117	2,40	35 x 30	
	1500	133	93	2,46	30 x 45	
		133	93	2,53	35 x 35	
		1800	111	78	2,98	35 x 45
	2200	91	64	3,10	35 x 50	
		270	737	516	1,08	22 x 25
		330	603	423	1,30	22 x 30
<b>180 (225) 2K</b>	390	511	358	1,35	25 x 25	
		470	424	297	1,50	22 x 35
		424	297	1,62	25 x 30	
	560	356	249	1,62	22 x 40	
		356	249	1,69	25 x 35	
		356	249	1,67	30 x 25	
	680	293	205	1,76	22 x 50	
		293	205	1,72	25 x 40	
		293	205	1,74	30 x 30	
	820	293	205	1,92	35 x 25	
		243	170	1,78	25 x 45	
		243	170	1,85	30 x 35	
	1000	199	140	1,91	25 x 50	
		199	140	2,01	30 x 40	
		199	140	2,16	35 x 30	
	1200	166	117	2,19	30 x 45	
		166	117	2,34	35 x 35	
		133	93	2,36	30 x 50	
1500	133	93	2,56	35 x 40		
	1800	111	78	2,67	35 x 45	
	220	905	634	1,08	22 x 25	
<b>200 (250) 2D</b>	270	737	516	1,20	22 x 30	
		330	603	423	1,30	22 x 30
		330	603	423	1,35	25 x 25
	390	511	358	1,41	22 x 35	
		470	424	297	1,50	22 x 40
		424	297	1,47	25 x 30	
	560	424	297	1,56	30 x 25	
		356	249	1,58	22 x 45	
		356	249	1,65	25 x 35	
	680	293	205	1,68	22 x 50	
		293	205	1,80	25 x 40	
		293	205	1,82	30 x 30	
	820	293	205	1,96	35 x 25	
		243	170	1,87	25 x 50	
		243	170	1,99	30 x 35	
	1000	243	170	2,07	35 x 30	
		199	140	2,17	30 x 45	
		199	140	2,22	35 x 35	
1200	166	117	2,22	30 x 50		
	166	117	2,42	35 x 40		
	133	93	2,59	35 x 45		
1800	111	78	2,70	35 x 50		
	180	1106	774	0,94	22 x 25	
	220	905	634	1,10	22 x 30	
<b>250 (300) 2E</b>	270	905	634	1,15	25 x 25	
		330	737	516	1,13	22 x 35
		603	423	1,20	22 x 40	
	390	603	423	1,30	25 x 30	
		603	423	1,35	30 x 25	
		511	358	1,26	22 x 45	
	470	511	358	1,41	25 x 35	
		424	297	1,37	22 x 50	
		424	297	1,52	25 x 40	
	560	424	297	1,36	30 x 30	
		424	297	1,40	35 x 25	
		356	249	1,59	25 x 45	
	680	356	249	1,57	30 x 35	
		356	249	1,56	35 x 30	
		293	205	1,66	25 x 50	
	820	293	205	1,76	30 x 40	
		243	170	1,83	30 x 45	
		243	170	1,82	35 x 35	
1000	199	140	1,87	30 x 50		
	199	140	1,99	35 x 40		
	1200	166	117	2,10	35 x 45	

Snap-In

U <sub>R,DC</sub> (Surge Voltage) Code	Rated Capacitance	Max ESR 20°C, 120Hz	Typ ESR 20°C, 120Hz	Max Ripple Current 105°C, 120Hz	Size Ø D x L
(V)	(µF)	(mΩ)	(mΩ)	(Arms)	(mm)
<b>350 (400) 2V</b>	68	2926	1610	0,56	22 x 25
		1990	1095	0,70	22 x 30
		1990	1095	0,70	25 x 25
	100	1658	912	0,73	22 x 35
		1327	730	0,79	22 x 40
		1327	730	0,82	25 x 30
	120	1327	730	0,82	30 x 25
		1327	730	0,82	30 x 25
		1106	608	0,81	22 x 45
	150	1106	608	0,89	25 x 35
		1106	608	0,90	30 x 30
		905	498	0,93	22 x 50
	180	905	498	0,97	25 x 40
		905	498	0,98	35 x 25
		737	406	1,01	25 x 50
	220	737	406	1,05	30 x 35
		737	406	1,01	35 x 30
		603	332	1,16	30 x 45
270	603	332	1,16	35 x 35	
	511	281	1,26	30 x 50	
	511	281	1,26	35 x 40	
330	424	233	1,35	35 x 45	
	356	196	1,51	35 x 50	
	68	2926	1522	0,47	22 x 25
<b>400 (450) 2G</b>	82	2427	1262	0,56	22 x 30
		2427	1262	0,65	25 x 25
		1990	1035	0,60	22 x 30
	100	1658	863	0,64	22 x 35
		1658	863	0,70	25 x 30
		1658	863	0,78	30 x 25
	120	1327	690	0,70	22 x 40
		1327	690	0,73	25 x 35
		1106	575	0,78	22 x 50
	150	1106	575	0,82	25 x 40
		1106	575	0,83	30 x 30
		1106	575	0,86	35 x 25
	180	905	471	0,87	25 x 45
		905	471	0,86	30 x 35
		737	384	0,94	25 x 50
	220	737	384	0,95	30 x 40
		737	384	0,91	35 x 30
		603	314	1,11	30 x 45
270	603	314	1,13	35 x 35	
	511	266	1,15	30 x 50	
	511	266	1,26	35 x 40	
330	424	221	1,31	35 x 45	
	356	185	1,50	35 x 50	
	293	153	1,9	35 x 55	
390	242	126	2,2	35 x 60	
	242	126	2,2	40 x 50	
	56	4737	2369	0,47	22 x 25
<b>450 (500) 2W</b>	68	3903	1951	0,56	22 x 30
		3903	1951	0,56	25 x 25
		3236	1618	0,65	22 x 35
	82	2653	1327	0,70	22 x 40
		2653	1327	0,70	25 x 30
		2653	1327	0,78	30 x 25
	100	2211	1106	0,73	22 x 45
		2211	1106	0,73	25 x 35
		1769	885	0,78	22 x 50
	120	1769	885	0,82	25 x 40
		1769	885	0,83	30 x 30
		1769	885	0,86	35 x 25
	150	1474	737	0,87	25 x 45
		1474	737	0,86	30 x 35
		1206	603	0,94	25 x 50
	180	1206	603	0,95	30 x 40
		1206	603	0,91	35 x 30
		983	492	1,11	30 x 45
220	983	492	1,13	35 x 35	
	804	402	1,15	30 x 50	
	804	402	1,26	35 x 40	
270	681	341	1,31	35 x 45	
	565	283	1,50	35 x 50	
	473	237	1,7	35 x 55	
330	391	176	2,0	35 x 60	
	391	176	2,0	40 x 50	
	324	162	2,2	35 x 65	
390	324	162	2,3	40 x 60	
	39	6802	3401	0,35	22 x 30
	47	5644	2822	0,41	22 x 35
<b>500 (550) 2H</b>	56	4737	2369	0,47	22 x 40
		3901	1951	0,54	22 x 45
		3235	1618	0,62	25 x 40
	68	2653	1327	0,67	25 x 45
		2211	1106	0,77	25 x 50
		2211	1106	0,72	35 x 30
	82	1769	885	0,85	30 x 40
		1474	737	1,01	30 x 50
		1206	603	1,12	35 x 45
	100	983	492	1,29	35 x 50

Customer specific products and adaptations on request.

## Order Code Radial & Snap-In Electrolytic Capacitors

EC	R	1V	QX	221	M	LL	50	1012		JExxxx	
Technology	Terminal Type	Rated Voltage Code	Series Code	Capacitance Code	Capacitance Tolerance	Terminal Style	Terminal / Pitch	Dimension	Material Code	Rubber Type	for Specials only
EC = Electrolytic Capacitor	Radial = R	6,3V = 0J	CD <b>110</b> = PT	0,1 = 0R1	<b>±20%</b> = M	Radial:	2,0mm = 20	4x7 = 0407	- = Standard	- = Standard	
	Snap-In = S	10V = 1A	CD <b>11GL</b> = GL	0,47 = R47	±10% = K	<b>Taped</b> = FF	2,5mm = 25	5x11,5 = 0511	V = PVC	F = Flat Rubber	
		16V = 1C	CD <b>261</b> = LK	1,0 = 010	+30 / -10% = Q	<b>Long Lead</b> = LL	3,5mm = 35	10x20 = 1020	E = PET	S = Stand-Off	
		20V = 1D	CD <b>261X</b> = QX	2,2 = 2R2	+20 / -0% = R	Cut 5,0mm = CB	5,0mm = 50	35x80 = 3580			
		25V = 1E	CD <b>262</b> = QM	100 = 101	±15% = L	<b>Cut 4,5mm</b> = CC	7,5mm = 75	45x100 = 45100			
		35V = 1V	CD <b>263</b> = BK	1000 = 102	+20 / -10% = V	Cut 4,0mm = CD	10,0mm = 10				
		40V = 1G	CD <b>269</b> = PH	10000 = 103		Cut 3,5mm = CE	12,5mm = 12				
		50V = 1H	CD <b>269L</b> = HL			Cut 3,0mm = CF					
		63V = 1J	CD <b>281</b> = LL			on request: alternative lead forms (Keyed Polarity, axial, 90° - bended, others)					
		80V = 1K	CD <b>281L</b> = LH								
		100V = 2A	CD <b>287</b> = GC								
		125V = 2B	CD <b>28L</b> = QL								
		160V = 2C	CD <b>293</b> = BZ								
		180V = 2K	CD <b>294</b> = BW								
		200V = 2D	CD <b>295</b> = BC								
		250V = 2E	CD <b>295S</b> = BS								
		385V = 2J	CD <b>296</b> = KC								
		400V = 2G	CD <b>296L</b> = FL								
		415V = 2P	CD <b>297</b> = BB								
		420V = 2X	CD <b>299</b> = PG								
		450V = 2W	CD <b>29C</b> = QC								
		500V = 2H	CD <b>29D</b> = HR								
		550V = 2Y	CD <b>29G</b> = BA								
		575V = 2Z	CD <b>29H</b> = QH								
		600V = 2S	CD <b>29L</b> = QL								
		630V = J2	CD <b>29U</b> = CU								
			CD <b>801</b> = ZP								
			CD <b>804</b> = ZM								
			CD <b>811</b> = ZN								
			CD <b>840</b> = ZQ								
			CD <b>891</b> = ZJ								
			CD <b>892</b> = ZL								
			CD <b>895</b> = ZK								

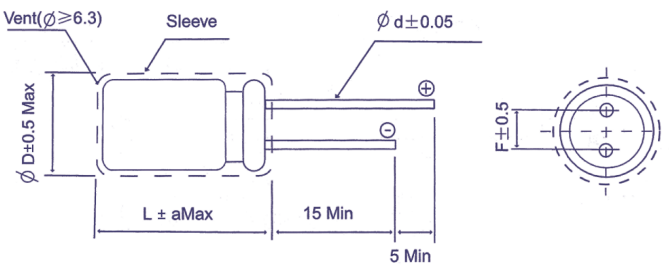
**Snap-In:**

4,0mm Pin Length = T/L4	<b>2 Pin = P2</b>
<b>6,3mm Pin Length = T/L6</b>	3 Pin = P3
Soldering Pin = S4	4 Pin = P4
on request:	5 Pin = P5
alternative pin types	6 Pin = P6

preferred

## Technical Specification Radial Type Electrolytic Capacitors

Dimensions for loose, long-lead type (bulk)  
Order Code: LL



L	L ≤ 7					L ≥ 11									
∅ D	3	4	5	6,3	8	5	6,3	8	10	12,5	16	18	20	22	25
F	1,0	1,5	2,0	2,5	3,5	2,0	2,5	3,5	5,0		7,5		10,0		12,5
∅ d	0,4		0,45			0,5		0,6		0,8				1,0	
a <sub>Max</sub>	1,0					2,0					2,5				

For diameter 20 pitch 7,5 on request. in mm

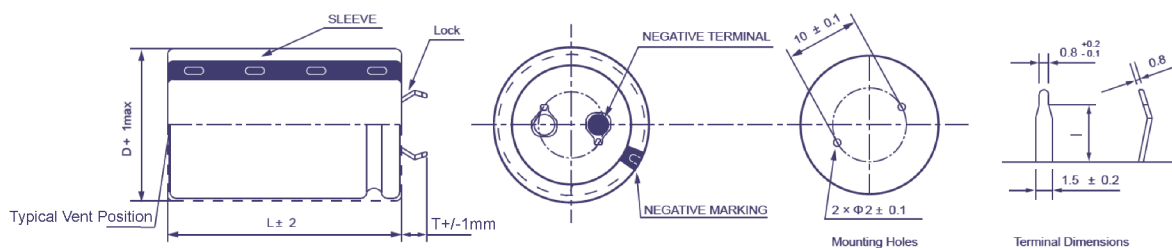
Dimensions for loose, short cut leads (bulk)  
Order Code: CC (CB, CD, CE, CF)

	Straight Lead		Bended Lead			
<b>Code</b>	CB	<b>CC</b>	CD	CE	CF	
<b>I</b>	5,0 ± 0,5	<b>4,5 ± 0,5</b>	4,0 ± 0,5	3,5 ± 0,5	3,0 ± 0,5	

preferred in mm

## Technical Specification **Snap-In Type**

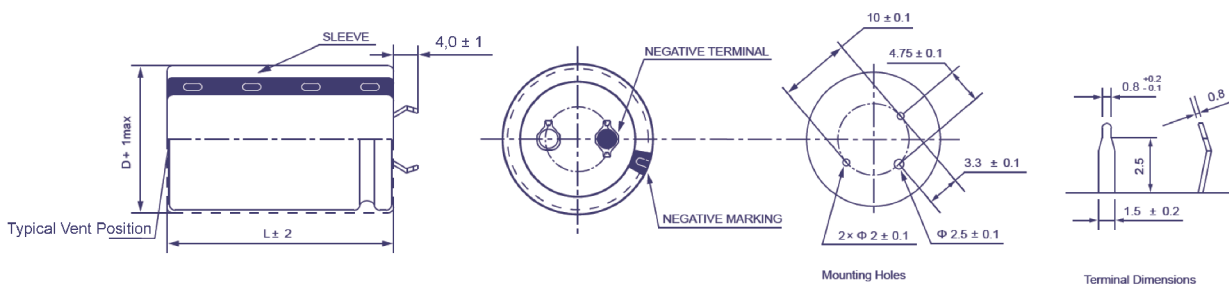
### 2 Pin Type: T6P2 / T4P2 Standard



Standard Version: Self-Lock Terminal.  
 Other terminal types and styles on request.  
 For diameter  $\varnothing D \geq 45\text{mm}$  the safety vent is typically placed at the side of the housing.

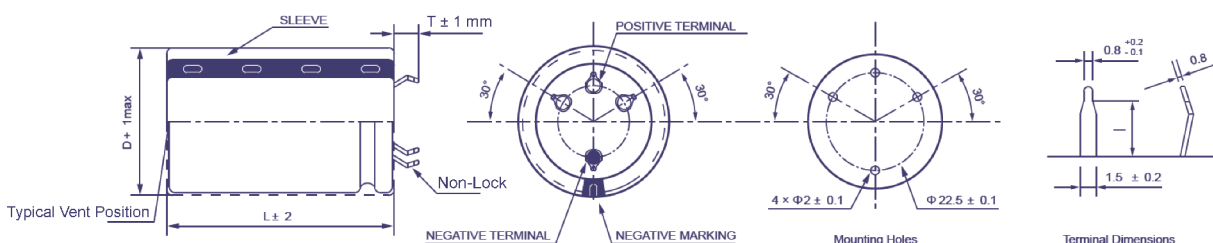
Terminal	T6	T4
Pin Length T	6,3 mm preferred	4,0 mm
Pin Detail I	3,5 mm preferred	2,5 mm

### 3 Pin Type: T4P3



For diameter  $\varnothing D \geq 45\text{mm}$  the safety vent is typically placed at the side of the housing.

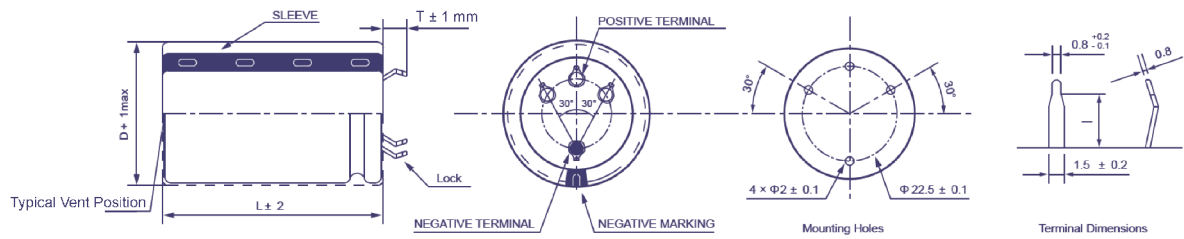
### 4 Pin Type: T6P4 / T4P4 Standard



Standard Version: Non-Lock Terminal  
 For  $\varnothing D \geq 30\text{mm}$  only.  
 Other terminal types and styles on request.  
 For diameter  $\varnothing D \geq 45\text{mm}$  the safety vent is typically placed at the side of the housing.

Terminal	T6	T4
Pin Length T	6,3 mm preferred	4,0 mm
Pin Detail I	3,5 mm preferred	2,5 mm

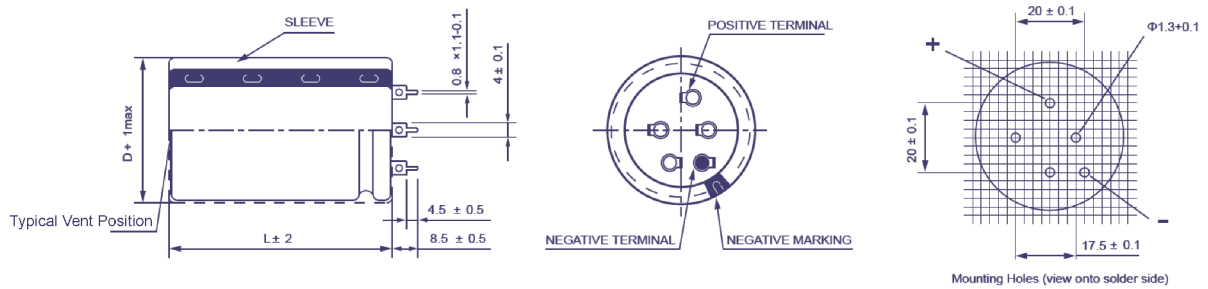
### 4 Pin Type: L6P4 / L4P4 Self-Lock Terminal



For  $\varnothing D \geq 30$  mm only.  
 Other terminal types and styles on request.  
 For Diameter  $\varnothing D \geq 45$  mm the safety vent is typically placed at the side of the housing.

Terminal	L6	L4
Pin Length T	6,3 mm preferred	4,0 mm
Pin Detail I	3,5 mm preferred	2,5 mm

### 5 Pin Type: S4P5 Soldering Pin



For  $\varnothing D \geq 30$  mm only.  
 For diameter  $\varnothing D \geq 45$  mm the safety vent is typically placed at the side of the housing.

Other Terminal Styles on request.

## Jianghai Electrolytic Capacitors

**Warning:** JIANGHAI is not responsible for any extent of possible damages to persons or things, of any kind, caused by the improper application of and/or operating conditions harmful to electrolytic capacitors.

Misapplications which may cause failures include, but are not limited to: \* Ripple current or peak current or voltage above specification, \* Operating voltage above surge voltage specified, \* Temperature exposure beyond specified operating temperature range.

Examples of harmful operating conditions comprise, but are not limited to: \* unusual storage or transport temperatures, \* excessive and/or rapid changes of ambient temperature or humidity, \* heavy mechanical shock or vibration, \* corrosive and abrasive particles in the ambient (cooling) air, \* conducting dust in the ambient (cooling) air, \* oil or water vapor or corrosive substances, \* explosive gas or dust, \* operation under extremely high or low ambient pressure conditions (below or above sea level), \* superimposed radio frequency voltages, \* radioactivity. In case of doubt about the impact of operating conditions on capacitor performance, please contact JIANGHAI.

**Personal Safety:** Electrical or mechanical misapplication of electrolytic capacitors may be hazardous. Personal injury or property damage may result from explosion of a capacitor or from the expulsion of electrolyte due to mechanical disruption or the release of a safety vent of a capacitor. In case of injury or skin or eye exposure to electrolyte, immediately seek professional medical advice. Before using electrolytic capacitors in any application, please read these Handling Precautions, familiarizing thoroughly with the information contained herein. Please check before using any of our electrolytic capacitors if these components fulfill the requirements of your application and warnings and instructions for use are followed.

**Warranty:** The information contained in this catalogue does not form part of any quotation or contract, is believed to be accurate, reliable and up to date. Quality data are based on the statistical evaluations of a large quantity of parts and do not constitute a guarantee in a legal sense. However, agreement on these specifications does mean that the customer may claim for replacement of individual defective capacitors within the terms of delivery. We will not assume any liability beyond the replacement of defective components. This applies in particular to any consequential damage caused by component failure. Furthermore it must be taken into consideration that the figures stated for lifetime, failure rates and outlier percentages refer to the average production status and are therefore to be understood as mean values (statistic expectations) for a large number of delivery lots of identical capacitors. These figures are based on application experience and data obtained from preceding tests under normal conditions, or – for purpose of accelerated aging – more severe conditions. JIANGHAI reserves the right to change these specifications without prior notice. Any application information given is advisory and does not form part of any specification. The products are not primarily designed for use in life support applications, devices or systems where malfunction of these products can reasonably be expected to result in personal injury. JIANGHAI customers using or selling these products for use in such applications without prior written consent of JIANGHAI do so at their own risk and agree fully to indemnify JIANGHAI for any damage resulting from such improper use or sale. This version of the catalogue supersedes all previous versions. Latest versions of datasheets can be found on our homepage: [www.jianghai-europe.com](http://www.jianghai-europe.com) For more details on precautions and guidelines for aluminum electrolytic capacitors, please refer to CENELEC Technical Report CLC/TR 50454:2008 E, "Guide for the application of aluminum electrolytic capacitors".

**Polarity:** Electrolytic capacitors are polar and shall never be used with incorrect polarity, as there is a possible danger of shorting or destruction.

**Rated Voltage Ur:** The Rated Voltage is marked on the capacitor and defined in the datasheets as Ur. This voltage should never be exceeded and is the maximum peak voltage including any ripple voltages allowed to avoid a shortening of the lifetime or damage of the capacitor. When a ripple current is applied to the capacitor, the sum of the peak ripple voltage and bias DC voltage shall never exceed the Rated Voltage. It might be necessary to lower the maximum allowed bias DC voltage, when certain ripple currents are applied to the capacitor.

**Surge Voltage:** Maximum Voltage, which may be applied to the capacitor for short periods of time: max. 1000 cycles of 30 sec. per 6 min., max. 5 pulses per hour. Capacitance drift +/- 15% max.

**Reverse Voltage:** Reverse voltages or voltages < 0 V are not allowed.

**Recovery Voltage:** After charging and discharging a capacitor there might still be a voltage between the terminals, which is built up internally due to dielectric absorption. Please take action that this load does not damage other devices or scare the workers during production (sparks possible).

**Temperature Range:** Use electrolytic capacitors only within the specified operating temperature range.

**Over-Current:** Currents exceeding the rated ripple currents should be avoided.

**Ripple Current/Voltage:** The combined value of DC voltage and peak AC voltage (due to ripple current) shall not exceed the rated voltage and shall never be < 0 V. Use of aluminum electrolytic capacitors under ripple current with wide amplitudes is equivalent to quick charge-discharge operation.

**Rapid Charging/Discharging:** Rapid Charging/Discharging generates severe heat and gas may be emitted which may lead to explosion. Consult JIANGHAI about specially designed capacitors suitable for such kind of applications. Example: Servo Drive Application

**Balancing resistors:** Balancing resistors should be utilized if capacitors are used in serial connection. Please choose low-tolerance resistors to limit voltage drift.

**Charge-Discharge Proof:** JIANGHAI capacitors are charge-discharge proof, which means that 10<sup>6</sup> switching cycles will cause capacitance reduction of less than 10%.

**Lifetime:** There are many different lifetime definitions known without any true standard definition. Take special care when capacitors are compared that the capacitors fulfill the needed requirements. JIANGHAI publishes all conditions to be as transparent as possible. In the case of lifetime tests with additional ripple currents, the bias DC voltage must be reduced, so that the sum of bias DC voltage and the peak of the ripple voltage does not exceed the Rated Voltage Ur.

• **Load Life:** Period of time, during which the technical parameters of all capacitors stay within the given limits. JIANGHAI defines this without allowing for outliers.

• **Useful Life:** defined like load life, but a given percentage of components may be outside the defined limits. Useful life data are usually calculated within a confidence level of 60%. See further details in specifications and data sheets. Outlier percentage: ≤ 1%.

• **Endurance Test:** IEC 60384-4 defines the acceptable drift criteria of electrical parameters after the endurance tests (continuous voltage test).

• **Shelf Life:** Definition of time with acceptable drift of capacitor parameters after storage at upper category temperature without load. JIS-C-5102-1994

**Vibration and mechanical stress:** Capacitors are sensitive to vibration and mechanical forces applied on the leads. Do not use capacitors, which have been dropped onto a rigid surface.

**Insulation:** If any defect of the sleeve is visible, the component should not be used – same for any kind of visible damage. A capacitor should be electrically isolated from the following parts: Aluminum case, cathode lead wire, anode lead wire and circuit pattern, and auxiliary terminal of snap-in type. The PVC sleeve is not recognized as an isolator and therefore the standard capacitor should not be used in a place where insulation function is needed. Please contact JIANGHAI if higher grade of insulation is required.

### Environmental Conditions:

- Avoid direct contact with water, salt solution, oil, dewing conditions
- Halogens generally, especially fumigation treatment with bromides and flame retardant agents containing halogens must be avoided.
- Avoid exposing to direct sunshine, ozone, ultraviolet rays and x-ray radiation.
- Air Pressure: Max. 150kPa, min. 8kPa.
- No heavy air pressure changes are allowed.
- Do not use or store in an environment containing any hazardous gas (e.g., hydrogen sulphide, sulphurous acid, nitrous acid, chlorine, ammonia, bromine, methyl bromide, other halogens) or acidic or alkaline solutions.

### Storage:

- Temperature 5 to 35°C, Relative Humidity below 75%.
- Electrolytic capacitors may accumulate charge naturally during storage. In this case discharge through a 1kOhm resistor before use (Recovery Voltage).
- Leakage current may be increased after long storage time. In this case the capacitor should be subjected to the rated voltage treatment through a 1kOhm resistor before use for 1 hour, then it should be discharged through a resistor of about 1 Ohm/Volt.
- Storage times above 1 year should be avoided or rated voltage treatment may be necessary.
- In accordance to IEC 60384-4 electrolytic capacitors are subject to a reforming process before acceptance testing. Rated voltage is applied via a series resistance (100Ω: Ur ≤ 100VDC, 1kΩ: Ur > 100VDC).

**Soldering:** Soldering conditions (temperature, times) should be within specified conditions, especially for SMD components. Avoid high soldering temperatures as this may reduce lifetime or damage the capacitor. Do never dip the capacitor body into molten solder. Flux should not be adhered to the capacitor's body but only to its terminals. For details and different methods please contact us.

**Cleaning and Coating:** Do not use fixing agents or cleaning substances containing halogens and the epoxy resin coating materials. Also never use solvents containing: Halogenated hydrocarbons, alkali, petroleum, trichloroethylene/ethane, xylene, acetones, trichlorotrifluoroethane, tetrachloroethylene, methylenechloride, chloroform, acetates, ketones, esters, chlorides and bromides. In case of questions see detailed instructions.

**Mounting:** Other devices, which are mounted near the capacitor, should not touch the capacitor. Additional heat coming from other components near the capacitor may reduce the lifetime of the capacitor. Do never bend or twist the capacitor after soldering to avoid stress on the leads. Radial capacitors are not protected against mechanical forces on the leads. Forces on the pins might damage the capacitor. No printed circuit board tracks are allowed between the lead pads of the capacitor. Screw Terminal capacitors should only be mounted in an upright position.

**Transport:** Avoid fumigation and spraying insecticides (especially with bromides) in the import or export procedures which can cause corrosion. This applies also to the finished devices.

**Maintenance:** Periodical inspection should be carried out for the capacitor: visual inspection to check pressure relief open or leakage of electrolyte, electrical characteristics as leakage current, capacitance, and dissipation factor.

**Electrolyte and Separator paper:** Electrolyte and separator paper used in Aluminum Capacitors may be flammable. Also electrolyte is electrically conductive. Therefore in case electrolyte gets in contact with PC board it may cause corrosion of circuit pattern or cause short circuit between patterns, and may lead to smoke generation or ignition in worst case.

**Caution during Use of Capacitors:** Do not touch the terminals of capacitors. Keep the capacitor free from conductive solution, such as acids, alkali and so on. Ensure that the operating environment of the equipment into which the capacitor has been built is within the specified conditions mentioned in the catalogue or specification sheets.

**Safety Vent:** The safety vent needs some free space to open properly. Allow for free headroom of at least 2mm for diameter ≤16mm, more than 3mm for diameter 18-35mm, more than 5mm for case diameter 40mm and larger.

**Emergency Actions:** When the pressure relief vent is open and some gas blows out from the capacitor, please turn the main switch of the equipment off or pull out the plug from the power outlet immediately. During safety vent operation, extremely hot gas (>100°C) may blow out of the capacitors. Do not stand close to the capacitors. In case of eye contact, rinse the open eye(s) with clean water immediately. In case of ingestion, gargle with water immediately, do not swallow. Do not touch electrolyte but wash skin with soap and water in case of skin contact.

**Definition of electrical parameters:** Separate documents as application notes, equivalent circuit diagrams and so on are available on request.

**Packaging:** Please refer to the data book for details. Further information is available on request.