

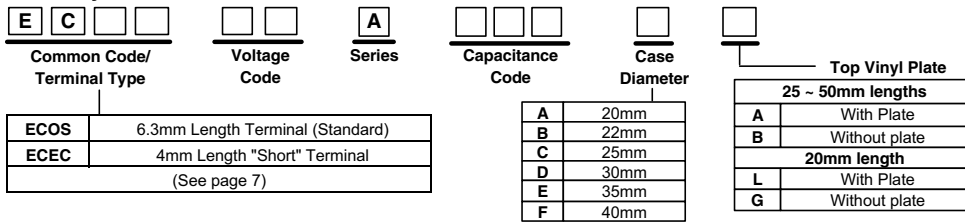
TS-HA Series two terminal snap-in

- 3000 hour* life at 105°C with high ripple current capability
- Wide range of case sizes including 20mm, low profile lengths
- **NEW:** 40mm diameter sizes through 100WV.
- Can vent construction



Rated Working Voltage:	10 ~ 250 VDC	385 ~ 450 VDC
Operating Temperature:	-40 ~ +105°C	-25 ~ +105°C
Nominal Capacitance:	68 ~ 68000µF (±20% tolerance)	33 ~ 470µF (±20% tolerance)
Dissipation Factor: (120 Hz, +20°C)	Working Voltage [V]:	10 16 25 35 50 63 80 100 - 450
	Max. D.F. (%):	55 45 35 30 25 20 17 15
For capacitance values > 33000µF, add the value of: $\frac{(\text{rated cap. } [\mu\text{F}] - 33000)}{1000}$		
Endurance:	3000 hours* at +105°C with maximum specified ripple current (see page 4) *2000 hours for 20mm diameter or 20mm length sizes	

Part Number System



Ripple Current
Multipliers:
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TS-HA Standard Ratings

Cap. (µF)	Size (mm) D x L	Max 105°C R.C. (A _{rms})		20°C ESR (Ω, max.)		Panasonic Part Number
		120Hz	10k~100kHz	120Hz	20kHz	
10 VDC Working, 13 VDC Surge						
6800	20 x 25	1.30	1.50	0.110	0.093	ECOS1AA682AA
8200	20 x 30	1.60	1.84	0.091	0.077	ECOS1AA822AA
10000	20 x 30	1.80	2.07	0.075	0.063	ECOS1AA103AA
12000	20 x 35	2.20	2.53	0.062	0.053	ECOS1AA123AA
15000	20 x 40	2.30	2.65	0.053	0.045	ECOS1AA153AA
4700	22 x 25	0.85	0.98	0.159	0.135	ECOS1AA472BA
6800	22 x 25	1.30	1.50	0.110	0.093	ECOS1AA682BA
10000	22 x 25	1.80	2.07	0.075	0.063	ECOS1AA103BA
12000	22 x 30	2.20	2.53	0.062	0.053	ECOS1AA123BA
15000	22 x 35	2.30	2.65	0.053	0.045	ECOS1AA153BA
18000	22 x 40	2.40	2.76	0.044	0.038	ECOS1AA183BA
22000	22 x 45	2.60	2.99	0.038	0.032	ECOS1AA223BA
27000	22 x 50	3.10	3.57	0.033	0.028	ECOS1AA273BA
15000	25 x 25	2.30	2.65	0.053	0.045	ECOS1AA153CA
18000	25 x 30	2.40	2.76	0.044	0.038	ECOS1AA183CA
22000	25 x 35	2.60	2.99	0.038	0.032	ECOS1AA223CA
27000	25 x 40	3.10	3.57	0.033	0.028	ECOS1AA273CA
33000	25 x 45	3.40	3.91	0.027	0.023	ECOS1AA333CA
39000	25 x 50	3.70	4.26	0.025	0.021	ECOS1AA393CA
22000	30 x 25	2.60	2.99	0.038	0.032	ECOS1AA223DA
27000	30 x 30	3.10	3.57	0.033	0.028	ECOS1AA273DA
33000	30 x 35	3.40	3.91	0.027	0.023	ECOS1AA333DA
39000	30 x 40	3.70	4.26	0.025	0.021	ECOS1AA393DA
47000	30 x 45	4.20	4.83	0.023	0.020	ECOS1AA473DA
56000	30 x 50	5.00	5.75	0.022	0.019	ECOS1AA563DA
27000	35 x 25	3.10	3.57	0.033	0.028	ECOS1AA273EA
33000	35 x 30	3.40	3.91	0.027	0.023	ECOS1AA333EA
39000	35 x 30	3.70	4.26	0.025	0.021	ECOS1AA393EA
47000	35 x 35	4.20	4.83	0.023	0.020	ECOS1AA473EA
56000	35 x 40	5.00	5.75	0.022	0.021	ECOS1AA563EA
68000	35 x 50	5.50	6.33	0.021	0.020	ECOS1AA683EA
62000	40 x 40	5.42	6.23	0.023	0.022	ECOS1AA623FA
82000	40 x 50	7.36	8.46	0.018	0.017	ECOS1AA823FA
16 VDC Working, 20 VDC Surge						
6800	20 x 30	2.20	2.53	0.085	0.068	ECOS1CA682AA
8200	20 x 35	2.40	2.76	0.071	0.057	ECOS1CA822AA
10000	20 x 40	2.60	2.99	0.066	0.053	ECOS1CA103AA
3300	22 x 20	1.30	1.50	0.216	0.173	ECOS1CA332BL
3300	22 x 25	1.30	1.50	0.176	0.141	ECOS1CA332BA
4700	22 x 25	1.52	1.75	0.123	0.099	ECOS1CA472BA
6800	22 x 25	2.20	2.53	0.085	0.068	ECOS1CA682BA
8200	22 x 30	2.40	2.76	0.071	0.057	ECOS1CA822BA
10000	22 x 30	2.60	2.99	0.066	0.053	ECOS1CA103BA
12000	22 x 35	2.90	3.34	0.055	0.044	ECOS1CA123BA
15000	22 x 40	3.20	3.68	0.046	0.037	ECOS1CA153BA
18000	22 x 45	3.50	4.03	0.040	0.034	ECOS1CA183BA
4700	25 x 20	1.60	1.84	0.152	0.121	ECOS1CA472CL
10000	25 x 25	2.60	2.99	0.066	0.053	ECOS1CA103CA
12000	25 x 30	2.90	3.34	0.055	0.044	ECOS1CA123CA
15000	25 x 35	3.20	3.68	0.046	0.037	ECOS1CA153CA
18000	25 x 40	3.50	4.03	0.040	0.034	ECOS1CA183CA
22000	25 x 45	3.80	4.37	0.033	0.028	ECOS1CA223CA
27000	25 x 50	4.20	4.83	0.028	0.025	ECOS1CA273CA
6800	30 x 20	1.80	2.07	0.105	0.084	ECOS1CA682DL
12000	30 x 25	2.90	3.34	0.055	0.044	ECOS1CA123DA
15000	30 x 30	3.20	3.68	0.046	0.037	ECOS1CA153DA
18000	30 x 30	3.50	4.03	0.040	0.034	ECOS1CA183DA
22000	30 x 35	3.80	4.37	0.033	0.028	ECOS1CA223DA
27000	30 x 40	4.20	4.83	0.028	0.025	ECOS1CA273DA
33000	30 x 45	4.70	5.41	0.023	0.020	ECOS1CA333DA
39000	30 x 50	5.10	5.87	0.022	0.020	ECOS1CA393DA
10000	35 x 20	2.40	2.76	0.071	0.057	ECOS1CA103EL
18000	35 x 25	3.50	4.03	0.040	0.034	ECOS1CA183EA
22000	35 x 30	3.80	4.37	0.033	0.028	ECOS1CA223EA
27000	35 x 30	4.20	4.83	0.028	0.025	ECOS1CA273EA
33000	35 x 35	4.70	5.41	0.023	0.020	ECOS1CA333EA
39000	35 x 40	5.10	5.87	0.022	0.020	ECOS1CA393EA
47000	35 x 45	5.50	6.33	0.020	0.018	ECOS1CA473EA
56000	35 x 50	6.00	6.90	0.019	0.017	ECOS1CA563EA
47000	40 x 40	5.50	6.33	0.020	0.018	ECOS1CA473FA
68000	40 x 50	7.29	8.38	0.015	0.014	ECOS1CA683FA

TS-HA Standard Ratings (continued)

Cap. (µF)	Size (mm) D x L	Max 105°C R.C. (A _{rms})		20°C ESR (Ω, max.)		Panasonic Part Number	Cap. (µF)	Size (mm) D x L	Max 105°C R.C. (A _{rms})		20°C ESR (Ω, max.)		Panasonic Part Number
		120Hz	10k~100kHz	120Hz	20kHz				120Hz	10k~100kHz	120Hz	20kHz	
250 VDC Working, 300 VDC Surge							385 VDC Working, 435 VDC Surge						
180	20 x 35	0.90	1.26	0.921	0.461	ECOS2EA181AA	56	20 x 30	0.51	0.71	2.368	0.829	ECOS2TA560AA
220	20 x 40	1.00	1.40	0.754	0.377	ECOS2EA221AA	68	20 x 35	0.56	0.78	1.950	0.683	ECOS2TA680AA
68	22 x 20	0.40	0.56	2.926	1.463	ECOS2EA680BL	82	20 x 40	0.64	0.90	1.617	0.566	ECOS2TA820AA
68	22 x 25	0.40	0.56	2.438	1.219	ECOS2EA680BA	33	22 x 20	0.20	0.28	5.024	1.758	ECOS2TA330BL
100	22 x 25	0.55	0.77	1.658	0.829	ECOS2EA101BA	56	22 x 25	0.51	0.71	2.368	0.829	ECOS2TA560BA
150	22 x 25	0.75	1.05	1.105	0.553	ECOS2EA151BA	68	22 x 30	0.56	0.78	1.950	0.683	ECOS2TA680BA
180	22 x 30	0.90	1.26	0.921	0.461	ECOS2EA181BA	82	22 x 35	0.64	0.90	1.617	0.566	ECOS2TA820BA
220	22 x 30	1.00	1.40	0.754	0.377	ECOS2EA221BA	100	22 x 35	0.69	0.97	1.326	0.464	ECOS2TA101BA
270	22 x 35	1.10	1.54	0.614	0.307	ECOS2EA271BA	120	22 x 35	0.75	1.05	1.105	0.387	ECOS2TA121BA
330	22 x 40	1.20	1.68	0.502	0.251	ECOS2EA331BA	150	22 x 50	0.82	1.15	0.884	0.309	ECOS2TA151BA
390	22 x 45	1.30	1.82	0.425	0.213	ECOS2EA391BA	47	25 x 20	0.25	0.35	3.527	1.235	ECOS2TA470CL
100	25 x 20	0.50	0.70	1.989	0.995	ECOS2EA101CL	68	25 x 25	0.56	0.78	1.950	0.683	ECOS2TA680CA
180	25 x 25	0.90	1.26	0.921	0.461	ECOS2EA181CA	82	25 x 25	0.64	0.90	1.617	0.566	ECOS2TA820CA
220	25 x 25	1.00	1.40	0.754	0.377	ECOS2EA221CA	100	25 x 30	0.69	0.97	1.326	0.464	ECOS2TA101CA
270	25 x 30	1.10	1.54	0.614	0.307	ECOS2EA271CA	120	25 x 30	0.75	1.05	1.105	0.387	ECOS2TA121CA
330	25 x 35	1.20	1.68	0.502	0.251	ECOS2EA331CA	150	25 x 40	0.82	1.15	0.884	0.309	ECOS2TA151CA
390	25 x 35	1.30	1.82	0.425	0.213	ECOS2EA391CA	180	25 x 45	0.95	1.33	0.737	0.258	ECOS2TA181CA
470	25 x 45	1.40	1.96	0.353	0.176	ECOS2EA471CA	220	25 x 50	1.10	1.54	0.603	0.211	ECOS2TA221CA
560	25 x 50	1.50	2.10	0.296	0.148	ECOS2EA561CA	68	30 x 20	0.35	0.49	2.438	0.853	ECOS2TA680DL
150	30 x 20	0.65	0.91	1.326	0.663	ECOS2EA151DL	150	30 x 30	0.82	1.15	0.884	0.309	ECOS2TA151DA
270	30 x 25	1.10	1.54	0.614	0.307	ECOS2EA271DA	180	30 x 35	0.95	1.33	0.737	0.258	ECOS2TA181DA
330	30 x 25	1.20	1.68	0.502	0.251	ECOS2EA331DA	220	30 x 40	1.10	1.54	0.603	0.211	ECOS2TA221DA
390	30 x 30	1.30	1.82	0.425	0.213	ECOS2EA391DA	270	30 x 45	1.20	1.68	0.491	0.172	ECOS2TA271DA
470	30 x 35	1.40	1.96	0.353	0.176	ECOS2EA471DA	330	30 x 50	1.35	1.89	0.402	0.161	ECOS2TA331DA
560	30 x 35	1.50	2.10	0.296	0.148	ECOS2EA561DA	100	35 x 20	0.47	0.66	1.658	0.580	ECOS2TA101EL
680	30 x 45	1.70	2.38	0.244	0.122	ECOS2EA681DA	180	35 x 25	0.95	1.33	0.737	0.258	ECOS2TA181EA
820	30 x 50	2.00	2.80	0.202	0.101	ECOS2EA821DA	220	35 x 30	1.10	1.54	0.603	0.211	ECOS2TA221EA
220	35 x 20	0.87	1.22	0.904	0.452	ECOS2EA221EL	270	35 x 35	1.20	1.68	0.491	0.172	ECOS2TA271EA
470	35 x 30	1.40	1.96	0.353	0.176	ECOS2EA471EA	330	35 x 40	1.35	1.89	0.402	0.161	ECOS2TA331EA
560	35 x 30	1.50	2.10	0.296	0.148	ECOS2EA561EA	390	35 x 45	1.55	2.17	0.340	0.136	ECOS2TA391EA
680	35 x 35	1.70	2.38	0.244	0.122	ECOS2EA681EA	470	35 x 50	1.75	2.45	0.282	0.127	ECOS2TA471EA
820	35 x 40	2.00	2.80	0.202	0.101	ECOS2EA821EA							
1000	35 x 45	2.20	3.08	0.199	0.099	ECOS2EA102EA							
1200	35 x 50	2.30	3.22	0.166	0.083	ECOS2EA122EA							
400 VDC Working, 450 VDC Surge							450 VDC Working, 500 VDC Surge						
56	20 x 30	0.51	0.71	2.368	0.829	ECOS2GA560AA	56	22 x 25	0.40	0.56	2.368	0.947	ECOS2WA560BA
68	20 x 35	0.56	0.78	1.950	0.683	ECOS2GA680AA	68	22 x 30	0.50	0.70	1.950	0.780	ECOS2WA680BA
82	20 x 40	0.64	0.90	1.617	0.566	ECOS2GA820AA	82	22 x 35	0.56	0.78	1.617	0.647	ECOS2WA820BA
33	22 x 20	0.20	0.28	5.024	1.758	ECOS2GA330BL	100	22 x 40	0.64	0.90	1.326	0.531	ECOS2WA101BA
33	22 x 25	0.30	0.42	4.521	1.582	ECOS2GA330BA	120	22 x 45	0.72	1.01	1.105	0.442	ECOS2WA121BA
47	22 x 25	0.43	0.60	2.822	0.988	ECOS2GA470BA	150	22 x 50	0.79	1.11	0.884	0.354	ECOS2WA151BA
56	22 x 25	0.51	0.71	2.368	0.829	ECOS2GA560BA	68	25 x 25	0.50	0.70	1.950	0.780	ECOS2WA680CA
68	22 x 30	0.56	0.78	1.950	0.683	ECOS2GA680BA	100	25 x 30	0.64	0.90	1.326	0.531	ECOS2WA101CA
82	22 x 35	0.64	0.90	1.617	0.566	ECOS2GA820BA	120	25 x 35	0.72	1.01	1.105	0.442	ECOS2WA121CA
100	22 x 35	0.69	0.97	1.326	0.464	ECOS2GA101BA	150	25 x 40	0.79	1.11	0.884	0.354	ECOS2WA151CA
120	22 x 40	0.75	1.05	1.105	0.387	ECOS2GA121BA	180	25 x 45	0.87	1.22	0.737	0.295	ECOS2WA181CA
150	22 x 50	0.82	1.15	0.884	0.309	ECOS2GA151BA	220	25 x 50	1.00	1.40	0.678	0.271	ECOS2WA221CA
47	25 x 20	0.25	0.35	3.527	1.235	ECOS2GA470CL	100	30 x 25	0.64	0.90	1.326	0.531	ECOS2WA101DA
68	25 x 25	0.56	0.78	1.950	0.683	ECOS2GA680CA	150	30 x 30	0.79	1.11	0.884	0.354	ECOS2WA151DA
82	25 x 25	0.64	0.90	1.617	0.566	ECOS2GA820CA	180	30 x 35	0.87	1.22	0.737	0.295	ECOS2WA181DA
100	25 x 30	0.69	0.97	1.326	0.464	ECOS2GA101CA	220	30 x 40	1.00	1.40	0.678	0.271	ECOS2WA221DA
120	25 x 35	0.75	1.05	1.105	0.387	ECOS2GA121CA	270	30 x 45	1.17	1.64	0.614	0.246	ECOS2WA271DA
150	25 x 40	0.82	1.15	0.884	0.309	ECOS2GA151CA	330	30 x 50	1.38	1.93	0.502	0.201	ECOS2WA331DA
180	25 x 45	0.95	1.33	0.737	0.258	ECOS2GA181CA	150	35 x 25	0.79	1.11	0.884	0.354	ECOS2WA151EA
220	25 x 50	1.10	1.54	0.603	0.211	ECOS2GA221CA	220	35 x 30	1.00	1.40	0.678	0.271	ECOS2WA221EA
68	30 x 20	0.35	0.49	2.438	0.853	ECOS2GA680DL	270	35 x 35	1.17	1.64	0.614	0.246	ECOS2WA271EA
120	30 x 25	0.75	1.05	1.105	0.387	ECOS2GA121DA	330	35 x 40	1.38	1.93	0.502	0.201	ECOS2WA331EA
150	30 x 30	0.82	1.15	0.884	0.309	ECOS2GA151DA	390	35 x 50	1.55	2.17	0.425	0.170	ECOS2WA391EA
180	30 x 35	0.95	1.33	0.737	0.258	ECOS2GA181DA							
220	30 x 40	1.10	1.54	0.603	0.211	ECOS2GA221DA							
270	30 x 45	1.20	1.68	0.491	0.172	ECOS2GA271DA							
330	30 x 50	1.35	1.89	0.402	0.161	ECOS2GA331DA							
100	35 x 20	0.47	0.66	1.658	0.580	ECOS2GA101EL							
180	35 x 25	0.95	1.33	0.737	0.258	ECOS2GA181EA							
220	35 x 30	1.10	1.54	0.603	0.211	ECOS2GA221EA							
270	35 x 35	1.20	1.68	0.491	0.172	ECOS2GA271EA							
330	35 x 40	1.35	1.89	0.402	0.161	ECOS2GA331EA							
390	35 x 45	1.55	2.17	0.340	0.136	ECOS2GA391EA							
470	35 x 50	1.75	2.45	0.282	0.127	ECOS2GA471EA							