

Series: **TS-HA**■ **Features**

- Compact size (30~40% smaller than TS-NH series)
- Long 2000 hour life at 105°C with high ripple current capability
- Wide range of case sizes including 20mm, low profile lengths
- Top vent construction

■ **Specifications**

Rated working voltage	10 ~ 250 VDC					385 ~ 450 VDC						
Operating temperature	-40 ~ +105°C					-25 ~ +105°C						
Nominal capacitance	68 ~ 68000 μF					33 ~ 470μF						
Dissipation factor (120 Hz, +20°C)	Working voltage (V):		10	16	25	35	50	63	80	100	160 ~ 400	450
	Max. D.F. (%):		55	45	35	30	25	20	17	15	15	20
For capacitance values > 33000μF, add the value of: $\frac{(\text{rated cap. } \mu\text{F}) - 33000 \mu\text{F}}{10000 \mu\text{F}} \times 0.1$												

Endurance 2000 hours at +105°C with maximum specified ripple current

■ **Part Number System**

E	C				A					
Common Code/ Terminal Type		Voltage Code		Series	Capacitance Code		Case Diameter		Top Vinyl Plate	
ECOS Standard 6mm length terminal					A 20mm		D 30mm		25~50mm lengths	
ECEC "Short" 4mm length terminal					B 22mm		E 35mm		20mm length	
					C 25mm				A With plate	
									B Without plate	
									L With plate	
									G Without plate	

■ **TS-HA Standard Ratings** (NOTE: Shaded listings indicate low profile products)

Cap. (µF)	Size (mm) D x L	Max. 105°C Ripple (Arms)		20°C ESR (Ω max.)		Panasonic Part No.	Cap. (µF)	Size (mm) D x L	Max. 105°C Ripple (Arms)		20°C ESR (Ω max.)		Panasonic Part No.
		120Hz	10k~50kHz	120Hz	20kHz				120Hz	10k~50kHz	120Hz	20kHz	
10 VDC Working, 13 VDC Surge							16 VDC Working, 20 VDC Surge						
6800	20 x 25	1.30	1.50	0.110	0.093	ECOS1AA682A □	3300	22 x 20	1.30	1.50	0.216	0.173	ECOS1CA332B □
8200	20 x 30	1.60	1.84	0.091	0.077	ECOS1AA822A □	4700	25 x 20	1.60	1.84	0.152	0.121	ECOS1CA472C □
10000	20 x 30	1.80	2.07	0.075	0.063	ECOS1AA1030A □	6800	25 x 20	2.20	2.53	0.085	0.068	ECOS1CA682A □
10000	22 x 25	1.80	2.07	0.075	0.063	ECOS1AA1030B □	6800	22 x 25	2.20	2.53	0.085	0.068	ECOS1CA682B □
12000	20 x 35	2.20	2.53	0.062	0.053	ECOS1AA123A □	6800	30 x 20	1.80	2.07	0.105	0.084	ECOS1CA682D □
12000	22 x 30	2.20	2.53	0.062	0.053	ECOS1AA123B □	8200	20 x 35	2.40	2.76	0.071	0.057	ECOS1CA822A □
15000	20 x 40	2.30	2.65	0.053	0.045	ECOS1AA153A □	8200	22 x 30	2.40	2.76	0.071	0.057	ECOS1CA822B □
15000	22 x 35	2.30	2.65	0.053	0.045	ECOS1AA153B □	10000	20 x 40	2.60	2.99	0.066	0.053	ECOS1CA103A □
15000	25 x 25	2.30	2.65	0.053	0.045	ECOS1AA153C □	10000	22 x 30	2.60	2.99	0.066	0.053	ECOS1CA103B □
18000	22 x 40	2.40	2.76	0.044	0.038	ECOS1AA183B □	10000	25 x 25	2.60	2.99	0.066	0.053	ECOS1CA103C □
18000	25 x 30	2.40	2.76	0.044	0.038	ECOS1AA183C □	10000	35 x 20	2.40	2.76	0.071	0.057	ECOS1CA103E □
22000	22 x 45	2.60	2.99	0.038	0.032	ECOS1AA223B □	12000	22 x 35	2.90	3.34	0.055	0.044	ECOS1CA123B □
22000	25 x 35	2.60	2.99	0.038	0.032	ECOS1AA223C □	12000	25 x 30	2.90	3.34	0.055	0.044	ECOS1CA123C □
22000	30 x 25	2.60	2.99	0.038	0.032	ECOS1AA223D □	12000	30 x 25	2.90	3.34	0.055	0.044	ECOS1CA123D □
27000	22 x 50	3.10	3.57	0.033	0.028	ECOS1AA273B □	15000	22 x 40	3.20	3.68	0.046	0.037	ECOS1CA153B □
27000	25 x 40	3.10	3.57	0.033	0.028	ECOS1AA273C □	15000	25 x 35	3.20	3.68	0.046	0.037	ECOS1CA153C □
27000	30 x 30	3.10	3.57	0.033	0.028	ECOS1AA273D □	15000	30 x 30	3.20	3.68	0.046	0.037	ECOS1CA153D □
27000	35 x 25	3.10	3.57	0.033	0.028	ECOS1AA273E □	18000	22 x 45	3.50	4.03	0.040	0.034	ECOS1CA183B □
33000	25 x 45	3.40	3.91	0.027	0.023	ECOS1AA333C □	18000	25 x 40	3.50	4.03	0.040	0.034	ECOS1CA183C □
33000	30 x 35	3.40	3.91	0.027	0.023	ECOS1AA333D □	18000	30 x 30	3.50	4.03	0.040	0.034	ECOS1CA183D □
33000	35 x 30	3.40	3.91	0.027	0.023	ECOS1AA333E □	18000	35 x 25	3.50	4.03	0.040	0.034	ECOS1CA183E □
39000	25 x 50	3.70	4.26	0.025	0.021	ECOS1AA393C □	22000	25 x 45	3.80	4.37	0.033	0.028	ECOS1CA223C □
39000	30 x 40	3.70	4.26	0.025	0.021	ECOS1AA393D □	22000	30 x 35	3.80	4.37	0.033	0.028	ECOS1CA223D □
39000	35 x 30	3.70	4.26	0.025	0.021	ECOS1AA393E □	22000	35 x 30	3.80	4.37	0.033	0.028	ECOS1CA223E □
47000	30 x 45	4.20	4.83	0.023	0.020	ECOS1AA473D □	27000	25 x 50	4.20	4.83	0.028	0.025	ECOS1CA273C □
47000	35 x 35	4.20	4.83	0.023	0.020	ECOS1AA473E □	27000	30 x 40	4.20	4.83	0.028	0.025	ECOS1CA273D □
56000	30 x 50	5.00	5.75	0.022	0.019	ECOS1AA563D □	27000	35 x 30	4.20	4.83	0.028	0.025	ECOS1CA273E □
56000	35 x 40	5.00	5.75	0.022	0.021	ECOS1AA563E □	33000	30 x 45	4.70	5.41	0.023	0.020	ECOS1CA333D □
68000	35 x 50	5.50	6.33	0.021	0.020	ECOS1AA583E □	33000	35 x 35	4.70	5.41	0.023	0.020	ECOS1CA333E □
							39000	30 x 50	5.10	5.87	0.022	0.020	ECOS1CA393D □
							39000	35 x 40	5.10	5.87	0.022	0.020	ECOS1CA393E □
							47000	35 x 45	5.50	6.33	0.020	0.018	ECOS1CA473E □
							56000	35 x 50	6.00	6.90	0.019	0.017	ECOS1CA563E □

■ TS-HA Standard Ratings (continued)

Cap. (μ F)	Size (mm) D x L	Max. 105°C Ripple (Arms)		20°C ESR (Ω max.)		Panasonic Part No.	Cap. (μ F)	Size (mm) D x L	Max. 105°C Ripple (Arms)		20°C ESR (Ω max.)		Panasonic Part No.
		120Hz	10k–50kHz	120Hz	20kHz				120Hz	10k–50kHz	120Hz	20kHz	
25 VDC Working, 32 VDC Surge							35 VDC Working, 44 VDC Surge						
2200	22 x 20	1.30	1.50	0.241	0.181	ECOS1EA222B □	1500	22 x 20	1.10	1.27	0.267	0.216	ECOS1VA152B □
3300	25 x 20	1.60	1.84	0.161	0.121	ECOS1EA332C □	2200	25 x 20	1.40	1.61	0.196	0.147	ECOS1VA222C □
4700	20 x 30	2.00	2.30	0.106	0.079	ECOS1EA472A □	3300	20 x 30	1.90	2.19	0.121	0.090	ECOS1VA332A □
4700	22 x 25	2.00	2.30	0.106	0.079	ECOS1EA472B □	3300	22 x 25	1.90	2.19	0.121	0.090	ECOS1VA332B □
4700	30 x 20	1.80	2.07	0.113	0.085	ECOS1EA472D □	3300	30 x 20	1.70	1.96	0.131	0.098	ECOS1VA332D □
5600	20 x 35	2.20	2.53	0.089	0.067	ECOS1EA562A □	3900	20 x 35	2.00	2.30	0.111	0.083	ECOS1VA392A □
5600	22 x 30	2.20	2.53	0.089	0.067	ECOS1EA562B □	3900	22 x 30	2.00	2.30	0.111	0.083	ECOS1VA392B □
6800	20 x 40	2.40	2.76	0.073	0.055	ECOS1EA682A □	4700	20 x 40	2.20	2.53	0.088	0.066	ECOS1VA472A □
6800	22 x 30	2.40	2.76	0.073	0.055	ECOS1EA682B □	4700	22 x 35	2.20	2.53	0.088	0.066	ECOS1VA472B □
6800	25 x 25	2.40	2.76	0.073	0.055	ECOS1EA682C □	4700	25 x 25	2.20	2.53	0.088	0.066	ECOS1VA472C □
6800	35 x 20	2.30	2.65	0.080	0.060	ECOS1EA682E □	4700	35 x 20	2.00	2.30	0.095	0.071	ECOS1VA472E □
8200	22 x 35	2.70	3.11	0.061	0.045	ECOS1EA822B □	5600	22 x 35	2.40	2.76	0.074	0.056	ECOS1VA562B □
8200	25 x 30	2.70	3.11	0.061	0.045	ECOS1EA822C □	5600	25 x 30	2.40	2.76	0.074	0.056	ECOS1VA562C □
8200	30 x 25	2.70	3.11	0.061	0.045	ECOS1EA822D □	5600	30 x 25	2.40	2.76	0.074	0.056	ECOS1VA562D □
10000	22 x 40	3.00	3.45	0.051	0.039	ECOS1EA103B □	6800	22 x 40	2.60	2.99	0.061	0.046	ECOS1VA682B □
10000	25 x 35	3.00	3.45	0.051	0.039	ECOS1EA103C □	6800	25 x 35	2.60	2.99	0.061	0.046	ECOS1VA682C □
10000	30 x 30	3.00	3.45	0.051	0.039	ECOS1EA103D □	6800	30 x 30	2.60	2.99	0.061	0.046	ECOS1VA682D □
12000	22 x 45	3.20	3.68	0.044	0.033	ECOS1EA123B □	8200	22 x 50	2.90	3.34	0.051	0.038	ECOS1VA822B □
12000	25 x 40	3.20	3.68	0.044	0.035	ECOS1EA123C □	8200	25 x 40	2.90	3.34	0.051	0.038	ECOS1VA822C □
12000	30 x 30	3.20	3.68	0.044	0.035	ECOS1EA123D □	8200	30 x 30	2.90	3.34	0.051	0.038	ECOS1VA822D □
12000	35 x 25	3.20	3.68	0.044	0.035	ECOS1EA123E □	8200	35 x 25	2.90	3.34	0.051	0.038	ECOS1VA822E □
15000	25 x 45	3.60	4.14	0.036	0.031	ECOS1EA153C □	10000	25 x 45	3.20	3.68	0.041	0.031	ECOS1VA103C □
15000	30 x 35	3.60	4.14	0.036	0.031	ECOS1EA153D □	10000	30 x 35	3.20	3.68	0.041	0.031	ECOS1VA103D □
15000	35 x 30	3.60	4.14	0.036	0.031	ECOS1EA153E □	10000	35 x 30	3.20	3.68	0.041	0.031	ECOS1VA103E □
18000	25 x 50	3.90	4.49	0.030	0.027	ECOS1EA183C □	12000	25 x 50	3.50	4.03	0.035	0.026	ECOS1VA123C □
18000	30 x 40	3.90	4.49	0.030	0.027	ECOS1EA183D □	12000	30 x 40	3.50	4.03	0.035	0.026	ECOS1VA123D □
18000	35 x 35	3.90	4.49	0.030	0.027	ECOS1EA183E □	12000	35 x 30	3.50	4.03	0.035	0.026	ECOS1VA123E □
22000	30 x 45	4.30	4.95	0.025	0.022	ECOS1EA223D □	15000	30 x 45	3.90	4.49	0.030	0.022	ECOS1VA153D □
22000	35 x 35	4.30	4.95	0.025	0.022	ECOS1EA223E □	15000	35 x 35	3.90	4.49	0.030	0.022	ECOS1VA153E □
27000	35 x 45	4.80	5.52	0.021	0.019	ECOS1EA273E □	18000	35 x 40	4.30	4.95	0.028	0.021	ECOS1VA183E □
33000	35 x 50	5.50	6.33	0.018	0.016	ECOS1EA333E □	22000	35 x 50	5.00	5.75	0.023	0.017	ECOS1VA223E □

Cap. (μ F)	Size (mm) D x L	Max. 105°C Ripple (Arms)		20°C ESR (Ω max.)		Panasonic Part No.	Cap. (μ F)	Size (mm) D x L	Max. 105°C Ripple (Arms)		20°C ESR (Ω max.)		Panasonic Part No.
		120Hz	10k–50kHz	120Hz	20kHz				120Hz	10k–50kHz	120Hz	20kHz	
50 VDC Working, 63 VDC Surge							63 VDC Working, 79 VDC Surge						
1000	22 x 20	0.90	1.04	0.265	0.199	ECOS1HA102B □	680	22 x 20	0.90	1.04	0.463	0.347	ECOS1JA681B □
1500	25 x 20	1.20	1.38	0.177	0.133	ECOS1HA152C □	1000	25 x 20	1.20	1.38	0.315	0.236	ECOS1JA102C □
1800	20 x 30	1.50	1.73	0.129	0.097	ECOS1HA182A □	1200	20 x 30	1.40	1.61	0.235	0.176	ECOS1JA122A □
1800	22 x 25	1.50	1.73	0.129	0.097	ECOS1HA182B □	1200	22 x 25	1.40	1.61	0.235	0.176	ECOS1JA122B □
2200	20 x 35	1.70	1.96	0.105	0.079	ECOS1HA222A □	1500	20 x 35	1.50	1.73	0.188	0.141	ECOS1JA152A □
2200	22 x 30	1.70	1.96	0.105	0.079	ECOS1HA222B □	1500	22 x 30	1.50	1.73	0.188	0.141	ECOS1JA152B □
2200	30 x 20	1.40	1.61	0.121	0.0890	ECOS1HA222D □	1500	30 x 20	1.30	1.50	0.210	0.157	ECOS1JA152D □
2700	20 x 40	1.80	2.07	0.086	0.064	ECOS1HA272A □	1800	20 x 40	1.70	1.96	0.157	0.117	ECOS1JA182A □
2700	22 x 30	1.80	2.07	0.086	0.064	ECOS1HA272B □	1800	22 x 30	1.70	1.96	0.157	0.117	ECOS1JA182B □
2700	25 x 25	1.80	2.07	0.086	0.064	ECOS1HA272C □	1800	25 x 25	1.70	1.96	0.157	0.117	ECOS1JA182C □
3300	22 x 35	2.00	2.30	0.070	0.053	ECOS1HA332B □	2200	22 x 35	2.00	2.30	0.128	0.096	ECOS1JA222B □
3300	25 x 30	2.00	2.30	0.070	0.053	ECOS1HA332C □	2200	25 x 30	2.00	2.30	0.128	0.096	ECOS1JA222C □
3300	35 x 20	1.70	1.96	0.085	0.064	ECOS1HA332E □	2200	35 x 20	1.50	1.73	0.143	0.107	ECOS1JA222E □
3900	22 x 40	2.20	2.53	0.064	0.048	ECOS1HA392B □	2700	22 x 40	2.20	2.53	0.104	0.078	ECOS1JA272B □
3900	25 x 35	2.20	2.53	0.064	0.048	ECOS1HA392C □	2700	25 x 35	2.20	2.53	0.104	0.078	ECOS1JA272C □
3900	30 x 25	2.20	2.53	0.064	0.048	ECOS1HA392D □	2700	30 x 25	2.20	2.53	0.104	0.078	ECOS1JA272D □
4700	22 x 45	2.50	2.88	0.053	0.040	ECOS1HA472B □	3300	22 x 50	2.50	2.88	0.090	0.068	ECOS1JA332B □
4700	25 x 40	2.50	2.88	0.053	0.040	ECOS1HA472C □	3300	25 x 40	2.50	2.88	0.090	0.068	ECOS1JA332C □
4700	30 x 30	2.50	2.88	0.053	0.040	ECOS1HA472D □	3300	30 x 30	2.50	2.88	0.090	0.068	ECOS1JA332D □
4700	35 x 25	2.50	2.88	0.053	0.040	ECOS1HA472E □	3300	35 x 25	2.50	2.88	0.090	0.068	ECOS1JA332E □
5600	22 x 50	2.80	3.22	0.050	0.038	ECOS1HA562B □	3900	25 x 45	2.70	3.11	0.077	0.057	ECOS1JA392C □
5600	25 x 40	2.80	3.22	0.050	0.038	ECOS1HA562C □	3900	30 x 35	2.70	3.11	0.077	0.057	ECOS1JA392D □
5600	30 x 35	2.80	3.22	0.050	0.038	ECOS1HA562D □	3900	35 x 30	2.70	3.11	0.077	0.057	ECOS1JA392E □
5600	35 x 30	2.80	3.22	0.050	0.038	ECOS1HA562E □	4700	25 x 50	3.00	3.45	0.063	0.048	ECOS1JA472C □
6800	25 x 50	3.30	3.80	0.046	0.035	ECOS1HA682C □	4700	30 x 40	3.00	3.45	0.063	0.048	ECOS1JA472D □
6800	30 x 40	3.30	3.80	0.046	0.035	ECOS1HA682D □	4700	35 x 30	3.00	3.45	0.063	0.048	ECOS1JA472E □
6800	35 x 30	3.30	3.80	0.046	0.035	ECOS1HA682E □	5600	30 x 45	3.30	3.80	0.053	0.040	ECOS1JA562D □
8200	30 x 45	3.60	4.14	0.038	0.029	ECOS1HA822D □	5600	35 x 35	3.30	3.80	0.053	0.040	ECOS1JA562E □
8200	35 x 35	3.60	4.14	0.038	0.029	ECOS1HA822E □	6800	30 x 50	3.60	4.14	0.049	0.037	ECOS1JA682D □
10000	30 x 50	4.00	4.60	0.033	0.025	ECOS1HA103D □	6800	35 x 40	3.60	4.14	0.049	0.037	ECOS1JA682E □
10000	35 x 40	4.00	4.60	0.033	0.025	ECOS1HA103E □	8200	35 x 45	3.90	4.49	0.040	0.030	ECOS1JA822E □
							10000	35 x 50	4.40	5.06	0.033	0.028	ECOS1JA103E □

■ TS-HA Standard Ratings (continued)

Cap. (μ F)	Size (mm) D x L	Max. 105°C Ripple (Arms)		20°C ESR (Ω max.)		Panasonic Part No.	Cap. (μ F)	Size (mm) D x L	Max. 105°C Ripple (Arms)		20°C ESR (Ω max.)		Panasonic Part No.	
		120Hz	10k–50kHz	120Hz	20kHz				120Hz	10k–50kHz	120Hz	20kHz		
80 VDC Working, 100 VDC Surge							100 VDC Working, 125 VDC Surge							
470	22 x 20	0.80	0.92	0.459	0.298	ECOS1KA471B □	330	22 x 20	0.80	1.20	0.653	0.392	ECOS2AA331B □	
680	25 x 20	1.00	1.15	0.317	0.206	ECOS1KA681C □	470	25 x 20	1.00	1.50	0.459	0.275	ECOS2AA471C □	
820	20 x 30	1.20	1.38	0.222	0.145	ECOS1KA821A □	560	20 x 30	1.10	1.65	0.296	0.178	ECOS2AA561A □	
820	22 x 25	1.20	1.38	0.222	0.145	ECOS1KA821B □	560	22 x 25	1.10	1.65	0.296	0.178	ECOS2AA561B □	
1000	20 x 35	1.30	1.50	0.182	0.119	ECOS1KA102A □	680	30 x 20	1.10	1.65	0.317	0.190	ECOS2AA581D □	
1000	22 x 30	1.30	1.50	0.182	0.119	ECOS1KA102B □	820	20 x 35	1.40	2.10	0.202	0.121	ECOS2AA821A □	
1000	25 x 25	1.30	1.50	0.182	0.119	ECOS1KA102C □	820	22 x 30	1.40	2.10	0.202	0.121	ECOS2AA821B □	
1000	30 x 20	1.20	1.38	0.216	0.140	ECOS1KA102D □	820	25 x 25	1.40	2.10	0.202	0.121	ECOS2AA821C □	
1200	20 x 40	1.50	1.73	0.166	0.116	ECOS1KA122A □	1000	20 x 40	1.70	2.55	0.182	0.109	ECOS2AA102A □	
1200	22 x 30	1.50	1.73	0.166	0.116	ECOS1KA122B □	1000	22 x 35	1.70	2.55	0.182	0.109	ECOS2AA102B □	
1200	25 x 25	1.50	1.73	0.166	0.116	ECOS1KA122C □	1000	25 x 30	1.70	2.55	0.182	0.109	ECOS2AA102C □	
1500	22 x 35	1.70	1.96	0.133	0.093	ECOS1KA152B □	1000	35 x 20	1.20	1.80	0.216	0.129	ECOS2AA102E □	
1500	25 x 30	1.70	1.96	0.133	0.093	ECOS1KA152C □	1200	22 x 40	1.80	2.70	0.152	0.091	ECOS2AA122B □	
1500	35 x 20	1.40	1.61	0.155	0.108	ECOS1KA152E □	1200	25 x 35	1.80	2.70	0.152	0.091	ECOS2AA122C □	
1800	22 x 40	1.80	2.07	0.111	0.077	ECOS1KA182B □	1200	30 x 25	1.80	2.70	0.152	0.091	ECOS2AA122D □	
1800	25 x 35	1.80	2.07	0.111	0.077	ECOS1KA182C □	1500	22 x 45	2.10	3.15	0.122	0.073	ECOS2AA152B □	
1800	30 x 25	1.80	2.07	0.111	0.077	ECOS1KA182D □	1500	25 x 40	2.10	3.15	0.122	0.079	ECOS2AA152C □	
2200	22 x 45	2.10	2.42	0.090	0.063	ECOS1KA222B □	1500	30 x 30	2.10	3.15	0.122	0.079	ECOS2AA152D □	
2200	25 x 35	2.10	2.42	0.090	0.063	ECOS1KA222C □	1500	35 x 25	2.10	3.15	0.122	0.079	ECOS2AA152E □	
2200	30 x 30	2.10	2.42	0.090	0.063	ECOS1KA222D □	1800	25 x 45	2.30	3.45	0.111	0.072	ECOS2AA182C □	
2200	35 x 25	2.10	2.42	0.090	0.063	ECOS1KA222E □	1800	30 x 35	2.30	3.45	0.111	0.072	ECOS2AA182D □	
2700	25 x 45	2.40	2.76	0.074	0.055	ECOS1KA272C □	1800	35 x 30	2.30	3.45	0.111	0.072	ECOS2AA182E □	
2700	30 x 35	2.40	2.76	0.074	0.055	ECOS1KA272D □	2200	25 x 50	2.60	3.90	0.090	0.059	ECOS2AA222C □	
2700	35 x 30	2.40	2.76	0.074	0.055	ECOS1KA272E □	2200	30 x 40	2.60	3.90	0.090	0.059	ECOS2AA222D □	
3300	25 x 50	2.60	2.99	0.065	0.049	ECOS1KA332C □	2200	35 x 30	2.60	3.90	0.090	0.059	ECOS2AA222E □	
3300	30 x 40	2.60	2.99	0.065	0.049	ECOS1KA332D □	2700	30 x 45	2.90	4.35	0.080	0.052	ECOS2AA272D □	
3300	35 x 30	2.60	2.99	0.065	0.049	ECOS1KA332E □	2700	35 x 35	2.90	4.35	0.080	0.052	ECOS2AA272E □	
3900	30 x 45	3.00	3.45	0.060	0.045	ECOS1KA392D □	3300	30 x 50	3.20	4.80	0.075	0.053	ECOS2AA332D □	
3900	35 x 35	3.00	3.45	0.060	0.045	ECOS1KA392E □	3300	35 x 40	3.20	4.80	0.075	0.053	ECOS2AA332E □	
4700	30 x 50	3.30	3.80	0.049	0.037	ECOS1KA472D □	3900	35 x 45	3.60	5.40	0.064	0.045	ECOS2AA392E □	
4700	35 x 40	3.30	3.80	0.049	0.037	ECOS1KA472E □	4700	35 x 50	3.80	5.70	0.053	0.040	ECOS2AA472E □	
5600	35 x 45	3.70	4.26	0.050	0.038	ECOS1KA562E □								
6800	35 x 50	3.90	4.49	0.041	0.031	ECOS1KA682E □								

Cap. (μ F)	Size (mm) D x L	Max. 105°C Ripple (Arms)		20°C ESR (Ω max.)		Panasonic Part No.	Cap. (μ F)	Size (mm) D x L	Max. 105°C Ripple (Arms)		20°C ESR (Ω max.)		Panasonic Part No.
		120Hz	10k-50kHz	120Hz	20kHz				120Hz	10k-50kHz	120Hz	20kHz	
160 VDC Working, 200 VDC Surge							200 VDC Working, 250 VDC Surge						
150	22 x 20	0.55	0.77	1.437	0.647	ECOS2CA151B □	100	22 x 20	0.50	0.70	1.989	0.895	ECOS2DA101B □
220	20 x 25	1.00	1.40	0.829	0.373	ECOS2CA221A □	150	25 x 20	0.65	0.91	1.326	0.597	ECOS2DA151C □
220	25 x 20	0.75	1.05	0.980	0.441	ECOS2CA221C □	220	20 x 30	1.00	1.40	0.754	0.339	ECOS2DA221A □
270	20 x 30	1.10	1.54	0.675	0.304	ECOS2CA271A □	220	22 x 25	1.00	1.40	0.754	0.339	ECOS2DA221B □
270	22 x 25	1.10	1.54	0.675	0.304	ECOS2CA271B □	220	30 x 20	0.87	1.22	0.904	0.407	ECOS2DA221D □
330	20 x 35	1.20	1.68	0.553	0.294	ECOS2CA331A □	270	20 x 35	1.10	1.54	0.614	0.276	ECOS2DA271A □
330	22 x 30	1.20	1.68	0.553	0.249	ECOS2CA331B □	270	22 x 30	1.10	1.54	0.614	0.276	ECOS2DA271B □
330	30 x 20	1.00	1.40	0.553	0.249	ECOS2CA331D □	270	25 x 25	1.10	1.54	0.614	0.276	ECOS2DA271C □
390	20 x 40	1.30	1.82	0.458	0.210	ECOS2CA391A □	330	20 x 40	1.20	1.68	0.502	0.226	ECOS2DA331A □
390	22 x 30	1.30	1.82	0.553	0.249	ECOS2CA391B □	330	22 x 30	1.20	1.68	0.502	0.226	ECOS2DA331B □
390	25 x 25	1.30	1.82	0.553	0.249	ECOS2CA391C □	330	25 x 25	1.20	1.68	0.502	0.226	ECOS2DA331C □
470	22 x 35	1.40	1.96	0.529	0.238	ECOS2CA471B □	330	35 x 20	1.10	1.54	0.603	0.271	ECOS2DA331E □
470	25 x 30	1.40	1.96	0.459	0.208	ECOS2CA471C □	390	22 x 35	1.30	1.82	0.425	0.191	ECOS2DA391B □
470	35 x 20	1.15	1.61	0.459	0.208	ECOS2CA471E □	390	25 x 30	1.30	1.82	0.425	0.191	ECOS2DA391C □
560	22 x 40	1.50	2.10	0.385	0.173	ECOS2CA561B □	390	30 x 25	1.30	1.82	0.425	0.191	ECOS2DA391D □
560	25 x 30	1.50	2.10	0.385	0.173	ECOS2CA561C □	470	22 x 40	1.40	1.96	0.353	0.159	ECOS2DA471B □
560	30 x 25	1.50	2.10	0.385	0.173	ECOS2CA561D □	470	25 x 35	1.40	1.96	0.353	0.159	ECOS2DA471C □
680	22 x 45	1.70	2.38	0.317	0.143	ECOS2CA681B □	470	30 x 25	1.40	1.96	0.353	0.159	ECOS2DA471D □
680	25 x 35	1.70	2.38	0.317	0.143	ECOS2CA681C □	560	22 x 45	1.50	2.10	0.296	0.133	ECOS2DA561B □
680	30 x 30	1.70	2.38	0.317	0.143	ECOS2CA681D □	560	25 x 35	1.50	2.10	0.296	0.133	ECOS2DA561C □
820	25 x 40	2.00	2.80	0.263	0.118	ECOS2CA821C □	560	30 x 30	1.50	2.10	0.296	0.133	ECOS2DA561D □
820	30 x 30	2.00	2.80	0.263	0.118	ECOS2CA821D □	680	25 x 40	1.70	2.38	0.244	0.110	ECOS2DA681C □
1000	25 x 45	2.20	3.08	0.216	0.108	ECOS2CA102C □	680	30 x 30	1.70	2.38	0.244	0.110	ECOS2DA681D □
1000	30 x 35	2.20	3.08	0.216	0.108	ECOS2CA102D □	820	25 x 50	2.00	2.80	0.222	0.111	ECOS2DA821C □
1200	25 x 50	2.30	3.22	0.180	0.090	ECOS2CA122C □	820	30 x 35	2.00	2.80	0.222	0.111	ECOS2DA821D □
1200	30 x 40	2.30	3.22	0.180	0.090	ECOS2CA122D □	820	35 x 30	2.00	2.80	0.222	0.111	ECOS2DA821E □
1500	30 x 45	2.50	3.50	0.166	0.083	ECOS2CA152D □	1000	30 x 45	2.20	3.08	0.199	0.099	ECOS2DA102D □
1500	35 x 35	2.50	3.50	0.166	0.083	ECOS2CA152E □	1000	35 x 35	2.20	3.08	0.199	0.099	ECOS2DA102E □
1800	30 x 50	2.70	3.78	0.138	0.083	ECOS2CA182D □	1200	30 x 50	2.30	3.22	0.165	0.083	ECOS2DA122D □
1800	35 x 40	2.70	3.78	0.000	0.000	ECOS2CA182E □	1200	35 x 40	2.30	3.22	0.166	0.083	ECOS2DA122E □
2200	35 x 50	2.90	4.06	0.000	0.000	ECOS2CA222E □	1500	35 x 50	2.50	3.50	0.144	0.072	ECOS2DA152E □

■ TS-HA Standard Ratings (continued)

Cap. (μ F)	Size (mm) D x L	Max. 105°C Ripple (Arms)		20°C ESR (Ω max.)		Panasonic Part No.	Cap. (μ F)	Size (mm) D x L	Max. 105°C Ripple (Arms)		20°C ESR (Ω max.)		Panasonic Part No.
		120Hz	10k–50kHz	120Hz	20kHz				120Hz	10k–50kHz	120Hz	20kHz	
250 VDC Working, 300 VDC Surge							385 VDC Working, 435 VDC Surge						
68	22 x 20	0.40	0.56	2.926	1.463	ECOS2EA680B □	33	22 x 20	0.20	0.28	5.024	1.758	ECOS2TA330B □
100	25 x 20	0.50	0.70	1.989	0.995	ECOS2EA101C □	47	25 x 20	0.25	0.35	3.527	1.235	ECOS2TA470C □
150	30 x 20	0.65	0.91	1.326	0.663	ECOS2EA151D □	56	20 x 30	0.51	0.71	2.368	0.829	ECOS2TA550A □
180	20 x 35	0.90	1.26	0.921	0.461	ECOS2EA181A □	56	22 x 25	0.51	0.71	2.368	0.829	ECOS2TA550B □
180	22 x 30	0.90	1.26	0.921	0.461	ECOS2EA181B □	68	20 x 35	0.56	0.78	1.950	0.683	ECOS2TA680A □
180	25 x 25	0.90	1.26	0.921	0.461	ECOS2EA181C □	68	22 x 30	0.56	0.78	1.950	0.683	ECOS2TA680B □
220	20 x 40	1.00	1.40	0.754	0.377	ECOS2EA221A □	68	25 x 25	0.56	0.78	1.950	0.683	ECOS2TA680C □
220	22 x 30	1.00	1.40	0.754	0.377	ECOS2EA221B □	68	30 x 20	0.35	0.49	2.438	0.853	ECOS2TA680D □
220	25 x 25	1.00	1.40	0.754	0.377	ECOS2EA221C □	82	20 x 40	0.64	0.90	1.617	0.566	ECOS2TA820A □
220	35 x 20	0.87	1.22	0.904	0.452	ECOS2EA221E □	82	22 x 35	0.64	0.90	1.617	0.566	ECOS2TA820B □
270	22 x 35	1.10	1.54	0.614	0.307	ECOS2EA271B □	82	25 x 25	0.64	0.90	1.617	0.566	ECOS2TA820C □
270	25 x 30	1.10	1.54	0.614	0.307	ECOS2EA271C □	100	22 x 35	0.69	0.97	1.326	0.464	ECOS2TA101B □
270	30 x 25	1.10	1.54	0.614	0.307	ECOS2EA271D □	100	25 x 30	0.69	0.97	1.326	0.464	ECOS2TA101C □
330	22 x 40	1.20	1.68	0.502	0.251	ECOS2EA331B □	100	35 x 20	0.47	0.66	1.658	0.580	ECOS2TA101E □
330	25 x 35	1.20	1.68	0.502	0.251	ECOS2EA331C □	120	22 x 35	0.75	1.05	1.105	0.387	ECOS2TA121B □
330	30 x 25	1.20	1.68	0.502	0.251	ECOS2EA331D □	120	25 x 30	0.75	1.05	1.105	0.387	ECOS2TA121C □
390	22 x 45	1.30	1.82	0.425	0.213	ECOS2EA391B □	150	22 x 50	0.82	1.15	0.884	0.309	ECOS2TA151B □
390	25 x 35	1.30	1.82	0.425	0.213	ECOS2EA391C □	150	25 x 40	0.82	1.15	0.884	0.309	ECOS2TA151C □
390	30 x 30	1.30	1.82	0.425	0.213	ECOS2EA391D □	150	30 x 30	0.82	1.15	0.884	0.309	ECOS2TA151D □
470	25 x 45	1.40	1.96	0.353	0.176	ECOS2EA471C □	180	25 x 45	0.86	1.33	0.737	0.258	ECOS2TA181C □
470	30 x 35	1.40	1.96	0.353	0.176	ECOS2EA471D □	180	30 x 35	0.95	1.33	0.737	0.258	ECOS2TA181D □
470	35 x 30	1.40	1.96	0.353	0.176	ECOS2EA471E □	180	35 x 25	0.95	1.33	0.737	0.258	ECOS2TA181E □
560	25 x 50	1.50	2.10	0.296	0.148	ECOS2EA561C □	220	25 x 50	1.10	1.54	0.603	0.211	ECOS2TA221C □
560	30 x 35	1.50	2.10	0.296	0.148	ECOS2EA561D □	220	30 x 40	1.10	1.54	0.603	0.211	ECOS2TA221D □
560	35 x 30	1.50	2.10	0.296	0.148	ECOS2EA561E □	220	35 x 30	1.10	1.54	0.603	0.211	ECOS2TA221E □
680	30 x 45	1.70	2.38	0.244	0.122	ECOS2EA681D □	270	30 x 45	1.20	1.68	0.491	0.172	ECOS2TA271D □
680	35 x 35	1.70	2.38	0.244	0.122	ECOS2EA681E □	270	35 x 35	1.20	1.68	0.491	0.172	ECOS2TA271E □
820	30 x 50	2.00	2.80	0.202	0.101	ECOS2EA821D □	330	30 x 50	1.35	1.89	0.402	0.161	ECOS2TA331D □
820	35 x 40	2.00	2.80	0.202	0.101	ECOS2EA821E □	330	35 x 40	1.35	1.89	0.402	0.161	ECOS2TA331E □
1000	35 x 45	2.20	3.08	0.199	0.099	ECOS2EA102E □	390	35 x 45	1.55	2.17	0.340	0.136	ECOS2TA391E □
1200	35 x 50	2.30	3.22	0.166	0.083	ECOS2EA122E □	470	35 x 50	1.75	2.45	0.282	0.127	ECOS2TA471E □

Cap. (μ F)	Size (mm) D x L	Max. 105° C Ripple (Arms)		20°C ESR (Ω max.)		Panasonic Part No.	Cap. (μ F)	Size (mm) D x L	Max. 105° C Ripple (Arms)		20°C ESR (Ω max.)		Panasonic Part No.
		120Hz	10k–50kHz	120Hz	20kHz				120Hz	10k–50kHz	120Hz	20kHz	
400 VDC Working, 450 VDC Surge							450 VDC Working, 500 VDC Surge						
33	22 x 20	0.20	0.28	5.024	1.758	ECOS2GA330B □	56	22 x 25	0.40	0.56	2.368	0.947	ECOS2WA560B □
47	25 x 20	0.25	0.35	3.527	1.235	ECOS2GA470C □	68	22 x 30	0.50	0.70	1.950	0.780	ECOS2WA680B □
56	20 x 30	0.51	0.71	2.368	0.829	ECOS2GA560A □	68	25 x 25	0.50	0.70	1.950	0.780	ECOS2WA680C □
56	22 x 25	0.51	0.71	2.368	0.829	ECOS2GA560B □	82	22 x 35	0.56	0.78	1.617	0.647	ECOS2WA820B □
68	20 x 35	0.56	0.78	1.950	0.683	ECOS2GA680A □	100	22 x 40	0.64	0.90	1.326	0.531	ECOS2WA101B □
68	22 x 30	0.56	0.78	1.950	0.683	ECOS2GA680B □	100	25 x 30	0.64	0.90	1.326	0.531	ECOS2WA101C □
68	25 x 25	0.56	0.78	1.950	0.683	ECOS2GA680C □	100	30 x 25	0.64	0.90	1.326	0.531	ECOS2WA101D □
68	30 x 20	0.35	0.49	2.438	0.853	ECOS2GA680D □	120	22 x 45	0.72	1.01	1.105	0.442	ECOS2WA121B □
82	20 x 40	0.64	0.90	1.617	0.566	ECOS2GA820A □	120	25 x 35	0.72	1.01	1.105	0.442	ECOS2WA121C □
82	22 x 35	0.64	0.90	1.617	0.566	ECOS2GA820B □	150	22 x 50	0.79	1.11	0.884	0.354	ECOS2WA151B □
82	25 x 25	0.64	0.90	1.617	0.566	ECOS2GA820C □	150	25 x 40	0.79	1.11	0.884	0.354	ECOS2WA151C □
100	22 x 35	0.69	0.97	1.326	0.464	ECOS2GA101B □	150	30 x 30	0.79	1.11	0.884	0.354	ECOS2WA151D □
100	25 x 30	0.69	0.97	1.326	0.464	ECOS2GA101C □	150	35 x 25	0.79	1.11	0.884	0.354	ECOS2WA151E □
100	35 x 20	0.47	0.66	1.658	0.580	ECOS2GA101E □	180	25 x 45	0.87	1.22	0.737	0.295	ECOS2WA181C □
120	22 x 40	0.75	1.05	1.105	0.387	ECOS2GA121B □	180	30 x 35	0.87	1.22	0.737	0.295	ECOS2WA181D □
120	25 x 35	0.75	1.05	1.105	0.387	ECOS2GA121C □	220	25 x 50	1.00	1.40	0.678	0.271	ECOS2WA221C □
120	30 x 25	0.75	1.05	1.105	0.387	ECOS2GA121D □	220	30 x 40	1.00	1.40	0.678	0.271	ECOS2WA221D □
150	22 x 50	0.82	1.15	0.884	0.309	ECOS2GA151B □	220	35 x 30	1.00	1.40	0.678	0.271	ECOS2WA221E □
150	25 x 40	0.82	1.15	0.884	0.309	ECOS2GA151C □	270	30 x 45	1.17	1.64	0.614	0.246	ECOS2WA271D □
150	30 x 30	0.82	1.15	0.884	0.309	ECOS2GA151D □	270	35 x 35	1.17	1.64	0.614	0.246	ECOS2WA271E □
180	25 x 45	0.95	1.33	0.737	0.258	ECOS2GA181C □	330	30 x 50	1.38	1.93	0.502	0.201	ECOS2WA331D □
180	30 x 35	0.95	1.33	0.737	0.258	ECOS2GA181D □	390	35 x 40	1.38	1.93	0.502	0.201	ECOS2WA331E □
180	35 x 25	0.95	1.33	0.737	0.258	ECOS2GA181E □	390	35 x 50	1.55	2.17	0.425	0.170	ECOS2WA391E □
220	25 x 50	1.10	1.54	0.603	0.211	ECOS2GA221C □							
220	30 x 40	1.10	1.54	0.603	0.211	ECOS2GA221D □							
220	35 x 30	1.10	1.54	0.603	0.211	ECOS2GA221E □							
270	30 x 45	1.20	1.68	0.491	0.172	ECOS2GA271D □							
270	35 x 35	1.20	1.68	0.491	0.172	ECOS2GA271E □							
330	30 x 50	1.35	1.89	0.402	0.161	ECOS2GA331D □							
330	35 x 40	1.35	1.89	0.402	0.161	ECOS2GA331E □							
390	35 x 45	1.55	2.17	0.340	0.136	ECOS2GA391E □							
470	35 x 50	1.75	2.45	0.282	0.127	ECOS2GA471E □							