TS-HA Series *105°C, 3000 hours**

- ***High ripple current capability***
- ***20mm lengths for low profile applications***
- ***2 and 3 pin versions available***

Rated Working Voltage:	10 ~ 250 VDC	385 ~ 450 VDC
Operating Temperature:	-40 ~ +105°C	-25 ~ +105°C
Nominal Capacitance:	68 ~ 82000µF (±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: $\frac{\text{(rated cap. [µF] - 33000)}}{1000}$

Leakage Current: $3\sqrt{CV}$ (µA) max. after 5 minutes; *C = Capacitance in µF, V = WV*

Ripple Current Multipliers:

Frequency(Hz):	50	60	100~120	500	1k	10k~
10~100WV:	0.93	0.95	1.0	1.05	1.08	1.15
160~450WV:	0.75	0.8	1.0	1.2	1.25	1.4

Ripple Current Ambient Temperature Factors**					
Ambient Temperature:	105°C	85°C	70°C	60°C	≤45°C
Multiplier:	1.0	1.7	2.0	2.2	2.35

Endurance: 3000 hours at +105°C with maximum specified ripple current (see page 6)
*2000 hours for 20mm length sizes

**Use of temperature ripple current multipliers may limit life to the hours specified for the maximum operating temperature.

Part Number System

E C □ □ — □ □ — A — □ □ □ — □ — □

Voltage Code — Series — Capacitance Code

Common Code / Terminal Type	
ECOS	2 pin, 6.3mm Length Terminal (Standard)
ECEC	2 pin, 4.0mm Length "Short" Terminal
ECE3	3 Pin, 4.0mm Length Terminal
(Please see page 10 for details)	

Case Diameter			
B	22mm	D	30mm
C	25mm	E	35mm

Insulation Options	
25 ~ 50mm lengths	
A	PVC with top plate
B	PVC without top plate
20mm length	
L	PVC with top plate
G	PVC without top plate

TS-HA Standard Ratings (part numbers shown with 2 pins, 6.3mm length terminal, and top vinyl plate)

Cap. (µF)	Size (mm) D x L	Max 105°C R.C. (A_{rms}) 120Hz	Max 105°C R.C. (A_{rms}) 10kHz~	20°C ESR (Ω, max.) 120Hz	20°C ESR (Ω, max.) 20kHz	Panasonic Part Number
10 VDC Working, 13 VDC Surge						
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**
	25 x 25	2.30	2.65	0.053	0.045	**ECOS1AA153CA**
18000	22 x 40	2.40	2.76	0.044	0.038	**ECOS1AA183BA**
	25 x 30	2.40	2.76	0.044	0.038	**ECOS1AA183CA**
22000	22 x 45	2.60	2.99	0.038	0.032	**ECOS1AA223BA**
	25 x 35	2.60	2.99	0.038	0.032	**ECOS1AA223CA**
	30 x 25	2.60	2.99	0.038	0.032	**ECOS1AA223DA**
27000	22 x 50	3.10	3.57	0.033	0.028	**ECOS1AA273BA**
	25 x 40	3.10	3.57	0.033	0.028	**ECOS1AA273CA**
	30 x 30	3.10	3.57	0.033	0.028	**ECOS1AA273DA**
	35 x 25	3.10	3.57	0.033	0.028	**ECOS1AA273EA**
33000	25 x 45	3.40	3.91	0.027	0.023	**ECOS1AA333CA**
	30 x 35	3.40	3.91	0.027	0.023	**ECOS1AA333DA**
	35 x 30	3.40	3.91	0.027	0.023	**ECOS1AA333EA**
39000	25 x 50	3.70	4.26	0.025	0.021	**ECOS1AA393CA**
	30 x 40	3.70	4.26	0.025	0.021	**ECOS1AA393DA**
	35 x 30	3.70	4.26	0.025	0.021	**ECOS1AA393EA**
47000	30 x 45	4.20	4.83	0.023	0.020	**ECOS1AA473DA**
	35 x 35	4.20	4.83	0.023	0.020	**ECOS1AA473EA**
56000	30 x 50	5.00	5.75	0.022	0.019	**ECOS1AA563DA**
	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**
16 VDC Working, 20 VDC Surge						
3300	22 x 20	1.30	1.50	0.216	0.173	**ECOS1CA332BL**
	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**
	25 x 20	1.60	1.84	0.152	0.121	**ECOS1CA472CL**
6800	22 x 25	2.20	2.53	0.085	0.068	**ECOS1CA682BA**
	30 x 20	1.80	2.07	0.105	0.084	**ECOS1CA682DL**
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**
	25 x 25	2.60	2.99	0.066	0.053	**ECOS1CA103CA**
16 VDC Working, 20 VDC Surge (continued)						
10000	35 x 20	2.40	2.76	0.071	0.057	**ECOS1CA103EL**
12000	22 x 35	2.90	3.34	0.055	0.044	**ECOS1CA123BA**
	25 x 30	2.90	3.34	0.055	0.044	**ECOS1CA123CA**
	30 x 25	2.90	3.34	0.055	0.044	**ECOS1CA123DA**
15000	22 x 40	3.20	3.68	0.046	0.037	**ECOS1CA153BA**
	25 x 35	3.20	3.68	0.046	0.037	**ECOS1CA153CA**
	30 x 30	3.20	3.68	0.046	0.037	**ECOS1CA153DA**
18000	22 x 45	3.50	4.03	0.040	0.034	**ECOS1CA183BA**
	25 x 40	3.50	4.03	0.040	0.034	**ECOS1CA183CA**
	30 x 30	3.50	4.03	0.040	0.034	**ECOS1CA183DA**
	35 x 25	3.50	4.03	0.040	0.034	**ECOS1CA183EA**
22000	25 x 45	3.80	4.37	0.033	0.028	**ECOS1CA223CA**
	30 x 35	3.80	4.37	0.033	0.028	**ECOS1CA223DA**
	35 x 30	3.80	4.37	0.033	0.028	**ECOS1CA223EA**
27000	25 x 50	4.20	4.83	0.028	0.025	**ECOS1CA273CA**
	30 x 40	4.20	4.83	0.028	0.025	**ECOS1CA273DA**
	35 x 30	4.20	4.83	0.028	0.025	**ECOS1CA273EA**
33000	30 x 45	4.70	5.41	0.023	0.020	**ECOS1CA333DA**
	35 x 35	4.70	5.41	0.023	0.020	**ECOS1CA333EA**
39000	30 x 50	5.10	5.87	0.022	0.020	**ECOS1CA393DA**
	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**
25 VDC Working, 32 VDC Surge						
2200	22 x 20	1.30	1.50	0.241	0.181	**ECOS1EA222BL**
	22 x 25	1.30	1.50	0.241	0.181	**ECOS1EA222BA**
3300	22 x 25	1.62	1.86	0.161	0.121	**ECOS1EA332BA**
	25 x 20	1.60	1.84	0.161	0.121	**ECOS1EA332CL**
4700	22 x 25	2.00	2.30	0.106	0.079	**ECOS1EA472BA**
	30 x 20	1.80	2.07	0.113	0.085	**ECOS1EA472DL**
5600	22 x 30	2.20	2.53	0.089	0.067	**ECOS1EA562BA**
6800	22 x 30	2.40	2.76	0.073	0.055	**ECOS1EA682BA**
	25 x 25	2.40	2.76	0.073	0.055	**ECOS1EA682CA**
	35 x 20	2.30	2.65	0.080	0.060	**ECOS1EA682EL**
8200	22 x 35	2.70	3.11	0.061	0.045	**ECOS1EA822BA**
	25 x 30	2.70	3.11	0.061	0.045	**ECOS1EA822CA**

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TS-HA Standard Ratings (continued)

Cap. (μF)	Size (mm) D x L	Max 105°C R.C. (A_{rms}) 120Hz	Max 105°C R.C. (A_{rms}) 10kHz~	20°C ESR (Ω, max.) 120Hz	20°C ESR (Ω, max.) 20kHz	Panasonic Part Number
25 VDC Working, 32 VDC Surge (continued)						
8200	30 x 25	2.70	3.11	0.061	0.045	ECOS1EA822DA
10000	22 x 40	3.00	3.45	0.051	0.039	ECOS1EA103BA
	25 x 35	3.00	3.45	0.051	0.039	ECOS1EA103CA
	30 x 30	3.00	3.45	0.051	0.039	ECOS1EA103DA
12000	22 x 45	3.20	3.68	0.044	0.033	ECOS1EA123BA
	25 x 40	3.20	3.68	0.044	0.035	ECOS1EA123CA
	30 x 30	3.20	3.68	0.044	0.035	ECOS1EA123DA
	35 x 25	3.20	3.68	0.044	0.035	ECOS1EA123EA
15000	25 x 45	3.60	4.14	0.036	0.031	ECOS1EA153CA
	30 x 35	3.60	4.14	0.036	0.031	ECOS1EA153DA
	35 x 30	3.60	4.14	0.036	0.031	ECOS1EA153EA
18000	25 x 50	3.90	4.49	0.030	0.027	ECOS1EA183CA
	30 x 40	3.90	4.49	0.030	0.027	ECOS1EA183DA
	35 x 35	3.90	4.49	0.030	0.027	ECOS1EA183EA
22000	30 x 45	4.30	4.95	0.025	0.022	ECOS1EA223DA
	35 x 35	4.30	4.95	0.025	0.022	ECOS1EA223EA
27000	35 x 45	4.80	5.52	0.021	0.019	ECOS1EA273EA
33000	35 x 50	5.50	6.33	0.018	0.016	ECOS1EA333EA
35 VDC Working, 44 VDC Surge						
1500	22 x 20	1.10	1.27	0.287	0.216	ECOS1VA152BL
	22 x 25	1.10	1.27	0.287	0.216	ECOS1VA152BA
2200	22 x 25	1.48	1.70	0.196	0.147	ECOS1VA222BA
	25 x 20	1.40	1.61	0.196	0.147	ECOS1VA222CL
3300	22 x 25	1.90	2.19	0.121	0.090	ECOS1VA332BA
	30 x 20	1.70	1.96	0.131	0.098	ECOS1VA332DL
3900	22 x 30	2.00	2.30	0.111	0.083	ECOS1VA392BA
4700	22 x 35	2.20	2.53	0.088	0.066	ECOS1VA472BA
	25 x 25	2.20	2.53	0.088	0.066	ECOS1VA472CA
	35 x 20	2.00	2.30	0.095	0.071	ECOS1VA472EL
5600	22 x 35	2.40	2.76	0.074	0.056	ECOS1VA562BA
	25 x 30	2.40	2.76	0.074	0.056	ECOS1VA562CA
	30 x 25	2.40	2.76	0.074	0.056	ECOS1VA562DA
6800	22 x 40	2.60	2.99	0.061	0.046	ECOS1VA682BA
	25 x 35	2.60	2.99	0.061	0.046	ECOS1VA682CA
	30 x 30	2.60	2.99	0.061	0.046	ECOS1VA682DA
8200	22 x 50	2.90	3.34	0.051	0.038	ECOS1VA822BA
	25 x 40	2.90	3.34	0.051	0.038	ECOS1VA822CA
	30 x 30	2.90	3.34	0.051	0.038	ECOS1VA822DA
	35 x 25	2.90	3.34	0.051	0.038	ECOS1VA822EA
10000	25 x 45	3.20	3.68	0.041	0.031	ECOS1VA103CA
	30 x 35	3.20	3.68	0.041	0.031	ECOS1VA103DA
	35 x 30	3.20	3.68	0.041	0.031	ECOS1VA103EA
12000	25 x 50	3.50	4.03	0.035	0.026	ECOS1VA123CA
	30 x 40	3.50	4.03	0.035	0.026	ECOS1VA123DA
	35 x 30	3.50	4.03	0.035	0.026	ECOS1VA123EA
15000	30 x 45	3.90	4.49	0.030	0.022	ECOS1VA153DA
	35 x 35	3.90	4.49	0.030	0.022	ECOS1VA153EA
18000	35 x 40	4.30	4.95	0.028	0.021	ECOS1VA183EA
22000	35 x 50	5.00	5.75	0.023	0.017	ECOS1VA223EA
50 VDC Working, 63 VDC Surge						
1000	22 x 20	0.90	1.04	0.265	0.199	ECOS1HA102BL
	22 x 25	0.90	1.04	0.232	0.174	ECOS1HA102BA
1500	22 x 25	1.25	1.44	0.155	0.116	ECOS1HA152BA
	25 x 20	1.20	1.38	0.177	0.133	ECOS1HA152CL
1800	22 x 25	1.50	1.73	0.129	0.097	ECOS1HA182BA
2200	22 x 30	1.70	1.96	0.105	0.079	ECOS1HA222BA
	30 x 20	1.40	1.61	0.121	0.090	ECOS1HA222DL
2700	22 x 30	1.80	2.07	0.086	0.064	ECOS1HA272BA
	25 x 25	1.80	2.07	0.086	0.064	ECOS1HA272CA
3300	22 x 35	2.00	2.30	0.070	0.053	ECOS1HA332BA
	25 x 30	2.00	2.30	0.070	0.053	ECOS1HA332CA
	35 x 20	1.70	1.96	0.085	0.064	ECOS1HA332EL
3900	22 x 40	2.20	2.53	0.064	0.048	ECOS1HA392BA
	25 x 35	2.20	2.53	0.064	0.048	ECOS1HA392CA
	30 x 25	2.20	2.53	0.064	0.048	ECOS1HA392DA
4700	22 x 45	2.50	2.88	0.053	0.040	ECOS1HA472BA
	25 x 40	2.50	2.88	0.053	0.040	ECOS1HA472CA
	30 x 30	2.50	2.88	0.053	0.040	ECOS1HA472DA
	35 x 25	2.50	2.88	0.053	0.040	ECOS1HA472EA
5600	22 x 50	2.80	3.22	0.050	0.038	ECOS1HA562BA
	25 x 40	2.80	3.22	0.050	0.038	ECOS1HA562CA
	30 x 35	2.80	3.22	0.050	0.038	ECOS1HA562DA
	35 x 30	2.80	3.22	0.050	0.038	ECOS1HA562EA
6800	25 x 50	3.30	3.80	0.046	0.035	ECOS1HA682CA
	30 x 40	3.30	3.80	0.046	0.035	ECOS1HA682DA

Cap. (μF)	Size (mm) D x L	Max 105°C R.C. (A_{rms}) 120Hz	Max 105°C R.C. (A_{rms}) 10kHz~	20°C ESR (Ω, max.) 120Hz	20°C ESR (Ω, max.) 20kHz	Panasonic Part Number
50 VDC Working, 63 VDC Surge (continued)						
6800	35 x 30	3.30	3.80	0.046	0.035	ECOS1HA682EA
8200	30 x 45	3.60	4.14	0.038	0.029	ECOS1HA822DA
	35 x 35	3.60	4.14	0.038	0.029	ECOS1HA822EA
10000	30 x 50	4.00	4.60	0.033	0.025	ECOS1HA103DA
	35 x 40	4.00	4.60	0.033	0.025	ECOS1HA103EA
12000	35 x 45	4.50	5.18	0.028	0.022	ECOS1HA123EA
15000	35 x 50	4.80	5.52	0.022	0.018	ECOS1HA153EA
63 VDC Working, 79 VDC Surge						
680	22 x 20	0.90	1.04	0.463	0.347	ECOS1JA681BL
	22 x 25	0.90	1.04	0.414	0.311	ECOS1JA681BA
1000	22 x 25	1.17	1.35	0.282	0.211	ECOS1JA102BA
	25 x 20	1.20	1.38	0.315	0.236	ECOS1JA102CL
1200	22 x 25	1.40	1.61	0.235	0.176	ECOS1JA122BA
1500	22 x 30	1.50	1.73	0.188	0.141	ECOS1JA152BA
	30 x 20	1.30	1.50	0.210	0.157	ECOS1JA152DL
1800	22 x 30	1.70	1.96	0.157	0.117	ECOS1JA182BA
	25 x 25	1.70	1.96	0.157	0.117	ECOS1JA182CA
2200	22 x 35	2.00	2.30	0.128	0.096	ECOS1JA222BA
	25 x 30	2.00	2.30	0.128	0.096	ECOS1JA222CA
	35 x 20	1.50	1.73	0.143	0.107	ECOS1JA222EL
2700	22 x 40	2.20	2.53	0.104	0.078	ECOS1JA272BA
	25 x 35	2.20	2.53	0.104	0.078	ECOS1JA272CA
	30 x 25	2.20	2.53	0.104	0.078	ECOS1JA272DA
3300	22 x 50	2.50	2.88	0.090	0.068	ECOS1JA332BA
	25 x 40	2.50	2.88	0.090	0.068	ECOS1JA332CA
	30 x 30	2.50	2.88	0.090	0.068	ECOS1JA332DA
	35 x 25	2.50	2.88	0.090	0.068	ECOS1JA332EA
3900	25 x 45	2.70	3.11	0.077	0.057	ECOS1JA392CA
	30 x 35	2.70	3.11	0.077	0.057	ECOS1JA392DA
	35 x 30	2.70	3.11	0.077	0.057	ECOS1JA392EA
4700	25 x 50	3.00	3.45	0.063	0.048	ECOS1JA472CA
	30 x 40	3.00	3.45	0.063	0.048	ECOS1JA472DA
	35 x 30	3.00	3.45	0.063	0.048	ECOS1JA472EA
5600	30 x 45	3.30	3.80	0.053	0.040	ECOS1JA562DA
	35 x 35	3.30	3.80	0.053	0.040	ECOS1JA562EA
6800	30 x 50	3.60	4.14	0.049	0.037	ECOS1JA682DA
	35 x 40	3.60	4.14	0.049	0.037	ECOS1JA682EA
8200	35 x 45	3.90	4.49	0.040	0.030	ECOS1JA822EA
10000	35 x 50	4.40	5.06	0.033	0.028	ECOS1JA103EA
80 VDC Working, 100 VDC Surge						
470	22 x 20	0.80	0.92	0.459	0.298	ECOS1KA471BL
	22 x 25	0.80	0.92	0.388	0.272	ECOS1KA471BA
680	22 x 25	1.00	1.15	0.268	0.188	ECOS1KA681BA
	25 x 20	1.00	1.15	0.317	0.206	ECOS1KA681CL
820	22 x 25	1.20	1.38	0.222	0.145	ECOS1KA821BA
1000	22 x 30	1.30	1.50	0.182	0.119	ECOS1KA102BA
	25 x 25	1.30	1.50	0.182	0.119	ECOS1KA102CA
	30 x 20	1.20	1.38	0.216	0.140	ECOS1KA102DL
1200	22 x 30	1.50	1.73	0.166	0.116	ECOS1KA122BA
	25 x 25	1.50	1.73	0.166	0.116	ECOS1KA122CA
1500	22 x 35	1.70	1.96	0.133	0.093	ECOS1KA152BA
	25 x 30	1.70	1.96	0.133	0.093	ECOS1KA152CA
	35 x 20	1.40	1.61	0.155	0.108	ECOS1KA152EL
1800	22 x 40	1.80	2.07	0.111	0.077	ECOS1KA182BA
	25 x 35	1.80	2.07	0.111	0.077	ECOS1KA182CA
	30 x 25	1.80	2.07	0.111	0.077	ECOS1KA182DA
2200	22 x 45	2.10	2.42	0.090	0.063	ECOS1KA222BA
	25 x 35	2.10	2.42	0.090	0.063	ECOS1KA222CA
	30 x 30	2.10	2.42	0.090	0.063	ECOS1KA222DA
	35 x 25	2.10	2.42	0.090	0.063	ECOS1KA222EA
2700	25 x 45	2.40	2.76	0.074	0.055	ECOS1KA272CA
	30 x 35	2.40	2.76	0.074	0.055	ECOS1KA272DA
	35 x 30	2.40	2.76	0.074	0.055	ECOS1KA272EA
3300	25 x 50	2.60	2.99	0.065	0.049	ECOS1KA332CA
	30 x 40	2.60	2.99	0.065	0.049	ECOS1KA332DA
	35 x 30	2.60	2.99	0.065	0.049	ECOS1KA332EA
3900	30 x 45	3.00	3.45	0.060	0.045	ECOS1KA392DA
	35 x 35	3.00	3.45	0.060	0.045	ECOS1KA392EA
4700	30 x 50	3.30	3.80	0.049	0.037	ECOS1KA472DA
	35 x 40	3.30	3.80	0.049	0.037	ECOS1KA472EA
5600	35 x 45	3.70	4.26	0.050	0.038	ECOS1KA562EA
6800	35 x 50	3.90	4.49	0.041	0.031	ECOS1KA682EA
100 VDC Working, 125 VDC Surge						
330	22 x 20	0.80	1.20	0.653	0.392	ECOS2AA331BL
	22 x 25	0.80	1.20	0.553	0.332	ECOS2AA331BA

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TS-HA Standard Ratings (continued)

Cap. (μF)	Size (mm) D x L	Max 105°C R.C. (A_{rms}) 120Hz	Max 105°C R.C. (A_{rms}) 10kHz~	20°C ESR (Ω, max.) 120Hz	20°C ESR (Ω, max.) 20kHz	Panasonic Part Number
100 VDC Working, 125 VDC Surge (continued)						
470	22 x 25	0.92	1.38	0.388	0.233	ECOS2AA471BA
	25 x 20	1.00	1.50	0.459	0.275	ECOS2AA471CL
560	22 x 25	1.10	1.65	0.296	0.178	ECOS2AA561BA
680	30 x 20	1.10	1.65	0.317	0.190	ECOS2AA681DL
820	22 x 30	1.40	2.10	0.202	0.121	ECOS2AA821BA
	25 x 25	1.40	2.10	0.202	0.121	ECOS2AA821CA
1000	22 x 35	1.70	2.55	0.182	0.109	ECOS2AA102BA
	25 x 30	1.70	2.55	0.182	0.109	ECOS2AA102CA
	35 x 20	1.20	1.80	0.216	0.129	ECOS2AA102EL
1200	22 x 40	1.80	2.70	0.152	0.091	ECOS2AA122BA
	25 x 35	1.80	2.70	0.152	0.091	ECOS2AA122CA
	30 x 25	1.80	2.70	0.152	0.091	ECOS2AA122DA
1500	22 x 45	2.10	3.15	0.122	0.073	ECOS2AA152BA
	25 x 40	2.10	3.15	0.122	0.079	ECOS2AA152CA
	30 x 30	2.10	3.15	0.122	0.079	ECOS2AA152DA
	35 x 25	2.10	3.15	0.122	0.079	ECOS2AA152EA
1800	25 x 45	2.30	3.45	0.111	0.072	ECOS2AA182CA
	30 x 35	2.30	3.45	0.111	0.072	ECOS2AA182DA
	35 x 30	2.30	3.45	0.111	0.072	ECOS2AA182EA
2200	25 x 50	2.60	3.90	0.090	0.059	ECOS2AA222CA
	30 x 40	2.60	3.90	0.090	0.059	ECOS2AA222DA
	35 x 30	2.60	3.90	0.090	0.059	ECOS2AA222EA
2700	30 x 45	2.90	4.35	0.080	0.052	ECOS2AA272DA
	35 x 35	2.90	4.35	0.080	0.052	ECOS2AA272EA
3300	30 x 50	3.20	4.80	0.075	0.053	ECOS2AA332DA
	35 x 40	3.20	4.80	0.075	0.053	ECOS2AA332EA
3900	35 x 45	3.60	5.40	0.064	0.045	ECOS2AA392EA
4700	35 x 50	3.80	5.70	0.053	0.040	ECOS2AA472EA
160 VDC Working, 200 VDC Surge						
150	22 x 20	0.55	0.77	1.437	0.647	ECOS2CA151BL
	22 x 25	0.61	0.85	1.216	0.547	ECOS2CA151BA
220	22 x 25	0.90	1.26	0.829	0.373	ECOS2CA221BA
	25 x 20	0.75	1.05	0.980	0.441	ECOS2CA221CL
270	22 x 25	1.10	1.54	0.675	0.304	ECOS2CA271BA
330	22 x 30	1.20	1.68	0.553	0.249	ECOS2CA331BA
	30 x 20	1.00	1.40	0.553	0.249	ECOS2CA331DL
390	22 x 30	1.30	1.82	0.553	0.249	ECOS2CA391BA
	25 x 25	1.30	1.82	0.553	0.249	ECOS2CA391CA
470	22 x 35	1.40	1.96	0.529	0.238	ECOS2CA471BA
	25 x 30	1.40	1.96	0.459	0.206	ECOS2CA471CA
	35 x 20	1.15	1.61	0.459	0.206	ECOS2CA471EL
560	22 x 40	1.50	2.10	0.385	0.173	ECOS2CA561BA
	25 x 30	1.50	2.10	0.385	0.173	ECOS2CA561CA
	30 x 25	1.50	2.10	0.385	0.173	ECOS2CA561DA
680	22 x 45	1.70	2.38	0.317	0.143	ECOS2CA681BA
	25 x 35	1.70	2.38	0.317	0.143	ECOS2CA681CA
	30 x 30	1.70	2.38	0.317	0.143	ECOS2CA681DA
820	25 x 40	2.00	2.80	0.263	0.118	ECOS2CA821CA
	30 x 30	2.00	2.80	0.263	0.118	ECOS2CA821DA
1000	25 x 45	2.20	3.08	0.216	0.108	ECOS2CA102CA
	30 x 35	2.20	3.08	0.216	0.108	ECOS2CA102DA
1200	25 x 50	2.30	3.22	0.180	0.090	ECOS2CA122CA
	30 x 40	2.30	3.22	0.180	0.090	ECOS2CA122DA
1500	30 x 45	2.50	3.50	0.166	0.083	ECOS2CA152DA
	35 x 35	2.50	3.50	0.166	0.083	ECOS2CA152EA
1800	30 x 50	2.70	3.78	0.138	0.083	ECOS2CA182DA
	35 x 40	2.70	3.78	0.138	0.069	ECOS2CA182EA
2200	35 x 50	2.90	4.06	0.113	0.057	ECOS2CA222EA
200 VDC Working, 250 VDC Surge						
100	22 x 20	0.50	0.70	1.989	0.895	ECOS2DA101BL
	22 x 25	0.50	0.70	1.658	0.746	ECOS2DA101BA
150	22 x 25	0.68	0.95	1.105	0.497	ECOS2DA151BA
	25 x 20	0.65	0.91	1.326	0.597	ECOS2DA151CL
220	22 x 25	1.00	1.40	0.754	0.339	ECOS2DA221BA
	30 x 20	0.87	1.22	0.904	0.407	ECOS2DA221DL
270	22 x 30	1.10	1.54	0.614	0.276	ECOS2DA271BA
	25 x 25	1.10	1.54	0.614	0.276	ECOS2DA271CA
330	22 x 30	1.20	1.68	0.502	0.226	ECOS2DA331BA
	25 x 25	1.20	1.68	0.502	0.226	ECOS2DA331CA
	35 x 20	1.10	1.54	0.603	0.271	ECOS2DA331EL
390	22 x 35	1.30	1.82	0.425	0.191	ECOS2DA391BA
	25 x 30	1.30	1.82	0.425	0.191	ECOS2DA391CA
	30 x 25	1.30	1.82	0.425	0.191	ECOS2DA391DA
470	22 x 40	1.40	1.96	0.353	0.159	ECOS2DA471BA
	25 x 35	1.40	1.96	0.353	0.159	ECOS2DA471CA
	30 x 25	1.40	1.96	0.353	0.159	ECOS2DA471DA
200 VDC Working, 250 VDC Surge (continued)						
560	22 x 45	1.50	2.10	0.296	0.133	ECOS2DA561BA
	25 x 35	1.50	2.10	0.296	0.133	ECOS2DA561CA
	30 x 30	1.50	2.10	0.296	0.133	ECOS2DA561DA
680	25 x 40	1.70	2.38	0.244	0.110	ECOS2DA681CA
	30 x 30	1.70	2.38	0.244	0.110	ECOS2DA681DA
820	25 x 50	2.00	2.80	0.222	0.111	ECOS2DA821CA
	30 x 35	2.00	2.80	0.222	0.111	ECOS2DA821DA
	35 x 30	2.00	2.80	0.222	0.111	ECOS2DA821EA
1000	30 x 45	2.20	3.08	0.199	0.099	ECOS2DA102DA
	35 x 35	2.20	3.08	0.199	0.099	ECOS2DA102EA
1200	30 x 50	2.30	3.22	0.166	0.083	ECOS2DA122DA
	35 x 40	2.30	3.22	0.166	0.083	ECOS2DA122EA
1500	35 x 50	2.50	3.50	0.144	0.072	ECOS2DA152EA
250 VDC Working, 300 VDC Surge						
68	22 x 20	0.40	0.56	2.926	1.463	ECOS2EA680BL
	22 x 25	0.40	0.56	2.438	1.219	ECOS2EA680BA
100	22 x 25	0.55	0.77	1.658	0.829	ECOS2EA101BA
	25 x 20	0.50	0.70	1.989	0.995	ECOS2EA101CL
150	22 x 25	0.75	1.05	1.105	0.553	ECOS2EA151BA
	30 x 20	0.65	0.91	1.326	0.663	ECOS2EA151DL
180	22 x 30	0.90	1.26	0.921	0.461	ECOS2EA181BA
	25 x 25	0.90	1.26	0.921	0.461	ECOS2EA181CA
220	22 x 30	1.00	1.40	0.754	0.377	ECOS2EA221BA
	25 x 25	1.00	1.40	0.754	0.377	ECOS2EA221CA
	35 x 20	0.87	1.22	0.904	0.452	ECOS2EA221EL
270	22 x 35	1.10	1.54	0.614	0.307	ECOS2EA271BA
	25 x 30	1.10	1.54	0.614	0.307	ECOS2EA271CA
	30 x 25	1.10	1.54	0.614	0.307	ECOS2EA271DA
330	22 x 40	1.20	1.68	0.502	0.251	ECOS2EA331BA
	25 x 35	1.20	1.68	0.502	0.251	ECOS2EA331CA
	30 x 25	1.20	1.68	0.502	0.251	ECOS2EA331DA
390	22 x 45	1.30	1.82	0.425	0.213	ECOS2EA391BA
	25 x 35	1.30	1.82	0.425	0.213	ECOS2EA391CA
	30 x 30	1.30	1.82	0.425	0.213	ECOS2EA391DA
470	25 x 45	1.40	1.96	0.353	0.176	ECOS2EA471CA
	30 x 35	1.40	1.96	0.353	0.176	ECOS2EA471DA
	35 x 30	1.40	1.96	0.353	0.176	ECOS2EA471EA
560	25 x 50	1.50	2.10	0.296	0.148	ECOS2EA561CA
	30 x 35	1.50	2.10	0.296	0.148	ECOS2EA561DA
	35 x 30	1.50	2.10	0.296	0.148	ECOS2EA561EA
680	30 x 45	1.70	2.38	0.244	0.122	ECOS2EA681DA
	35 x 35	1.70	2.38	0.244	0.122	ECOS2EA681EA
820	30 x 50	2.00	2.80	0.202	0.101	ECOS2EA821DA
	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
385 VDC Working, 435 VDC Surge						
33	22 x 20	0.20	0.28	5.024	1.758	ECOS2TA330BL
47	25 x 20	0.25	0.35	3.527	1.235	ECOS2TA470CL
56	22 x 25	0.51	0.71	2.368	0.829	ECOS2TA560BA
68	22 x 30	0.56	0.78	1.950	0.683	ECOS2TA680BA
	25 x 25	0.56	0.78	1.950	0.683	ECOS2TA680CA
	30 x 20	0.35	0.49	2.438	0.853	ECOS2TA680DL
82	22 x 35	0.64	0.90	1.617	0.566	ECOS2TA820BA
	25 x 25	0.64	0.90	1.617	0.566	ECOS2TA820CA
100	22 x 35	0.69	0.97	1.326	0.464	ECOS2TA101BA
	25 x 30	0.69	0.97	1.326	0.464	ECOS2TA101CA
	35 x 20	0.47	0.66	1.658	0.580	ECOS2TA101EL
120	22 x 35	0.75	1.05	1.105	0.387	ECOS2TA121BA
	25 x 30	0.75	1.05	1.105	0.387	ECOS2TA121CA
150	22 x 50	0.82	1.15	0.884	0.309	ECOS2TA151BA
	25 x 40	0.82	1.15	0.884	0.309	ECOS2TA151CA
	30 x 30	0.82	1.15	0.884	0.309	ECOS2TA151DA
180	25 x 45	0.95	1.33	0.737	0.258	ECOS2TA181CA
	30 x 35	0.95	1.33	0.737	0.258	ECOS2TA181DA
	35 x 25	0.95	1.33	0.737	0.258	ECOS2TA181EA
220	25 x 50	1.10	1.54	0.603	0.211	ECOS2TA221CA
	30 x 40	1.10	1.54	0.603	0.211	ECOS2TA221DA
	35 x 30	1.10	1.54	0.603	0.211	ECOS2TA221EA
270	30 x 45	1.20	1.68	0.491	0.172	ECOS2TA271DA
	35 x 35	1.20	1.68	0.491	0.172	ECOS2TA271EA
330	30 x 50	1.35	1.89	0.402	0.161	ECOS2TA331DA
	35 x 40	1.35	1.89	0.402	0.161	ECOS2TA331EA
390	35 x 45	1.55	2.17	0.340	0.136	ECOS2TA391EA
470	35 x 50	1.75	2.45	0.282	0.127	ECOS2TA471EA

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TS-HA Standard Ratings (continued)

Cap. (µF)	Size (mm) D x L	Max 105°C R.C. (A_{rms}) 120Hz	Max 105°C R.C. (A_{rms}) 10kHz~	20°C ESR (Ω, max.) 120Hz	20°C ESR (Ω, max.) 20kHz	Panasonic Part Number
400 VDC Working, 450 VDC Surge						
33	22 x 20	0.20	0.28	5.024	1.758	**ECOS2GA330BL**
	22 x 25	0.30	0.42	4.521	1.582	**ECOS2GA330BA**
47	22 x 25	0.43	0.60	2.822	0.988	**ECOS2GA470BA**
	25 x 20	0.25	0.35	3.527	1.235	**ECOS2GA470CL**
56	22 x 25	0.51	0.71	2.368	0.829	**ECOS2GA560BA**
68	22 x 30	0.56	0.78	1.950	0.683	**ECOS2GA680BA**
	25 x 25	0.56	0.78	1.950	0.683	**ECOS2GA680CA**
	30 x 20	0.35	0.49	2.438	0.853	**ECOS2GA680DL**
82	22 x 35	0.64	0.90	1.617	0.566	**ECOS2GA820BA**
	25 x 25	0.64	0.90	1.617	0.566	**ECOS2GA820CA**
100	22 x 35	0.69	0.97	1.326	0.464	**ECOS2GA101BA**
	25 x 30	0.69	0.97	1.326	0.464	**ECOS2GA101CA**
	35 x 20	0.47	0.66	1.658	0.580	**ECOS2GA101EL**
120	22 x 40	0.75	1.05	1.105	0.387	**ECOS2GA121BA**
	25 x 35	0.75	1.05	1.105	0.387	**ECOS2GA121CA**
	30 x 25	0.75	1.05	1.105	0.387	**ECOS2GA121DA**
150	22 x 50	0.82	1.15	0.884	0.309	**ECOS2GA151BA**
	25 x 40	0.82	1.15	0.884	0.309	**ECOS2GA151CA**
	30 x 30	0.82	1.15	0.884	0.309	**ECOS2GA151DA**
180	25 x 45	0.95	1.33	0.737	0.258	**ECOS2GA181CA**
	30 x 35	0.95	1.33	0.737	0.258	**ECOS2GA181DA**
	35 x 25	0.95	1.33	0.737	0.258	**ECOS2GA181EA**
220	25 x 50	1.10	1.54	0.603	0.211	**ECOS2GA221CA**
	30 x 40	1.10	1.54	0.603	0.211	**ECOS2GA221DA**
	35 x 30	1.10	1.54	0.603	0.211	**ECOS2GA221EA**
270	30 x 45	1.20	1.68	0.491	0.172	**ECOS2GA271DA**
	35 x 35	1.20	1.68	0.491	0.172	**ECOS2GA271EA**
330	30 x 50	1.35	1.89	0.402	0.161	**ECOS2GA331DA**
	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**
450 VDC Working, 500 VDC Surge						
56	22 x 25	0.40	0.56	2.368	0.947	**ECOS2WA560BA**
68	22 x 30	0.50	0.70	1.950	0.780	**ECOS2WA680BA**
	25 x 25	0.50	0.70	1.950	0.780	**ECOS2WA680CA**
82	22 x 35	0.56	0.78	1.617	0.647	**ECOS2WA820BA**
100	22 x 40	0.64	0.90	1.326	0.531	**ECOS2WA101BA**
	25 x 30	0.64	0.90	1.326	0.531	**ECOS2WA101CA**
	30 x 25	0.64	0.90	1.326	0.531	**ECOS2WA101DA**
120	22 x 45	0.72	1.01	1.105	0.442	**ECOS2WA121BA**
	25 x 35	0.72	1.01	1.105	0.442	**ECOS2WA121CA**
150	22 x 50	0.79	1.11	0.884	0.354	**ECOS2WA151BA**
	25 x 40	0.79	1.11	0.884	0.354	**ECOS2WA151CA**
	30 x 30	0.79	1.11	0.884	0.354	**ECOS2WA151DA**
	35 x 25	0.79	1.11	0.884	0.354	**ECOS2WA151EA**
180	25 x 45	0.87	1.22	0.737	0.295	**ECOS2WA181CA**
	30 x 35	0.87	1.22	0.737	0.295	**ECOS2WA181DA**
220	25 x 50	1.00	1.40	0.678	0.271	**ECOS2WA221CA**
	30 x 40	1.00	1.40	0.678	0.271	**ECOS2WA221DA**
	35 x 30	1.00	1.40	0.678	0.271	**ECOS2WA221EA**
270	30 x 45	1.17	1.64	0.614	0.246	**ECOS2WA271DA**
	35 x 35	1.17	1.64	0.614	0.246	**ECOS2WA271EA**
330	30 x 50	1.38	1.93	0.502	0.201	**ECOS2WA331DA**
	35 x 40	1.38	1.93	0.502	0.201	**ECOS2WA331EA**
390	35 x 50	1.55	2.17	0.425	0.170	**ECOS2WA391EA**

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