

### Aluminum Electrolytic Capacitors (Type Snap-In Series HA)

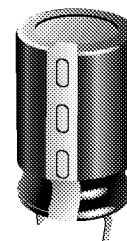
Series: HA

Type: TS (Snap-In)



STANDARD

IECQ Certified 105°C



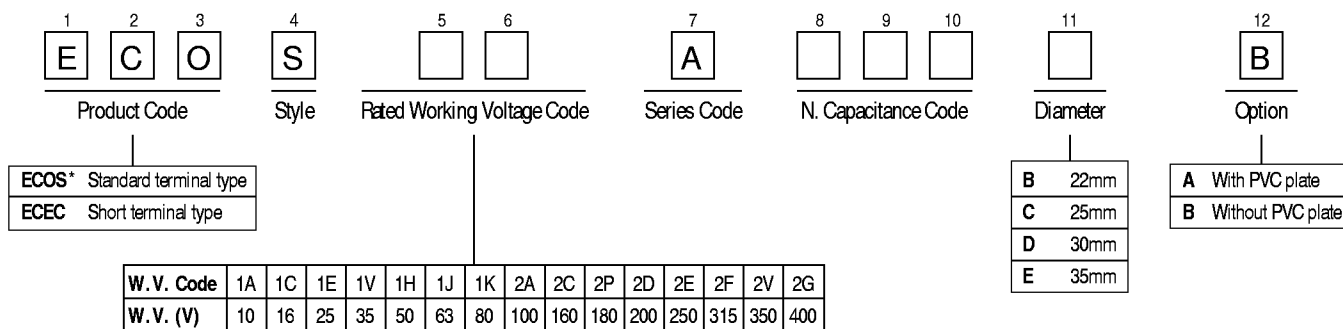
#### ■ Features

- Lifetime: 105°C 2000 h
- Snap-in terminals
- 20 to 25% smaller than series TS-NHE
- IEC pub. 384-4 approved

#### ■ Recommended Applications

- Smoothing circuits, AC adapters, inverter lighting systems

#### ■ Explanation of Part Numbers



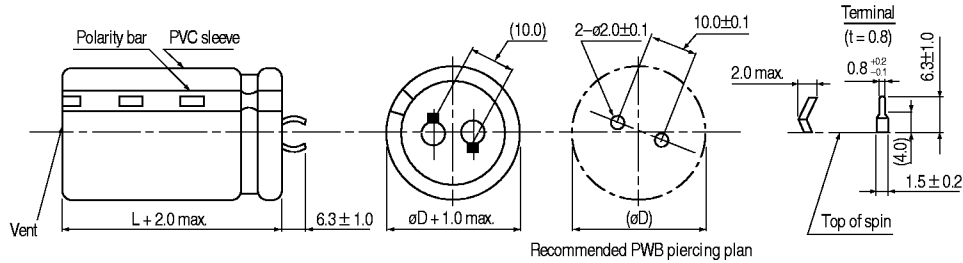
\* Our product code will be changed from ECO to ECE during April 1996 to March 1998. We will inform the revision date before our change.

#### ■ Specifications

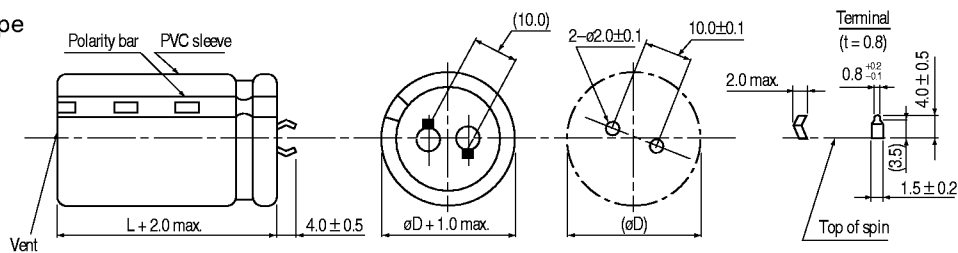
Operating temperature range	-40 to +105°C	-25 to +105°C														
Rated working voltage	10 to 250 V DC	315 to 400 V DC														
Nominal capacitance range	180 to 68000 μF	56 to 680 μF														
Capacitance tolerance	±20% (120 Hz/+20°C)															
DC leakage current	3√CV (μA) max. after 5 minutes application of rated working voltage at +20°C. C: Capacitance (μF) V: Working Voltage (V DC)															
tan δ	(120 Hz/+20°C)															
	Working Voltage (V)		10	16	25	35	50	63	80	100	160 to 400					
	tan δ		0.55	0.45	0.35	0.30	0.25	0.20	0.17	0.15	0.15					
	For capacitance value > 33000 μF, add the following calculated value:										$\frac{(\text{Rated capacitance}) - 33000 \mu\text{F}}{10000 \mu\text{F}} \times 0.1$					
Frequency correction factor for ripple current	Frequency (Hz)		50	60	100	120	500	1 k	10 k ~							
	C.F.		16 to 100 V	0.93	0.95	0.99	1.00	1.05	1.08	1.15						
Endurance	After 2,000 hours application of DC voltage with specified ripple current (≤ rated DC working voltage) at +105°C, the capacitor shall meet the following limits.															
	Capacitance change		±20% of initial measured value (±3.5 ±25%)													
	tan δ		≤ 200% of initial specified value													
	DC leakage current		≤ initial specified value													
Shelf life	After storage for 1,000 hours at +85°C with no voltage applied, capacitor shall meet the limits specified in "Endurance."															

### ■ Dimensions in mm (not to scale)

#### Standard terminal type



#### Short terminal type



### ■ Case Size/Ripple Current

(A) rms (120 Hz/+105°C)

Working Voltage (code)		10V (1A) – (SV) 13V			
Cap. (μF) (code)	Ripple Current	Case size øD x L 9mm)			
		B	C	D	E
10,000 (103)	1.80	22x25			
12,000 (123)	2.20	22x30			
15,000 (153)	2.30	22x35	25x25		
18,000 (183)	2.40	22x40	25x30		
22,000 (223)	2.60	22x45	25x35	30x25	
27,000 (273)	3.10	22x50	25x40	30x30	35x25
33,000 (333)	3.40		25x45	30x35	35x30
39,000 (393)	3.70		25x50	30x40	35x30
47,000 (473)	4.20			30x45	35x35
56,000 (563)	5.00			30x50	35x40
68,000 (683)	5.50				35x50 *

Working Voltage (code)		16V (1C) – (SV) 20V			
Cap. (μF) (code)	Ripple Current	Case size øD x L 9mm)			
		B	C	D	E
6,800 (682)	2.20	22x25			
8,200 (822)	2.40	22x30			
10,000 (103)	2.60	22x30	25x25		
12,000 (123)	2.90	22x35	25x30	30x25	
15,000 (153)	3.20	22x40	25x35	30x30	
18,000 (183)	3.50	22x45	25x40	30x30	35x25
22,000 (223)	3.80		25x45	30x35	35x30
27,000 (273)	4.20		25x50	30x40	35x30
33,000 (333)	4.70			30x45	35x35
39,000 (393)	5.10			30x50	35x40
47,000 (473)	5.50				35x45 *
56,000 (563)	6.00				35x50 *

Working Voltage (code)		25V (1E) – (SV) 32V			
Cap. (μF) (code)	Ripple Current	Case size øD x L 9mm)			
		B	C	D	E
4,700 (472)	2.00	22x25			
5,600 (562)	2.00	22x30			
6,800 (682)	2.40	22x30	25x25		
8,200 (822)	2.70	22x35	25x30	30x25	
10,000 (103)	3.00	22x40	25x35	30x30	
12,000 (123)	3.20	22x45	25x40	30x30	35x25
15,000 (153)	3.60		25x45	30x35	35x30
18,000 (183)	3.90		25x50	30x40	35x35
22,000 (223)	4.30			30x45	35x35
27,000 (273)	4.80				35x45 *
33,000 (333)	5.50				35x50 *

Working Voltage (code)		35V (1C) – (SV) 44V			
Cap. (μF) (code)	Ripple Current	Case size øD x L 9mm)			
		B	C	D	E
3,300 (332)	1.90	22x25			
3,900 (392)	2.00	22x30			
4,700 (472)	2.20	22x35			
5,600 (562)	2.40	22x35	25x30	30x25	
6,800 (682)	2.60	22x40	25x35	30x30	
8,200 (822)	2.90	22x50	25x40	30x30	35x25
10,000 (103)	3.20		25x45	30x35	35x30
12,000 (123)	3.50		25x50	30x40	35x30
15,000 (153)	3.90			30x45	35x35
18,000 (183)	4.30				35x40
22,000 (223)	5.00				35x50 *

\* When capacitors of ø35x45L and ø35x50L are mounted on PWB, reinforce them with mounting clamp or adhesives. (Avoid using adhesives including halogenated compositions.)

### ■ Case Size/Ripple Current (cont'd)

(A) rms (120 Hz/+105°C)

Working Voltage (code)		50V (1H) – (SV) 63V				
Cap. (μF) (code)	Ripple Current	Case size øD x L 9mm)				
		B	C	D	E	
1,800 (182)	1.50	22x25				
2,200 (222)	1.70	22x30				
2,700 (272)	1.80	22x30	25x25			
3,300 (332)	2.00	22x35	25x30			
3,900 (392)	2.20	22x40	25x35	30x25		
4,700 (472)	2.50	22x45	25x40	30x30	35x25	
5,600 (562)	2.80	22x50	25x40	30x35	35x30	
6,800 (682)	3.30		25x50	30x40	35x30	
8,200 (822)	3.60			30x45	35x35	
10,000 (103)	4.00			30x50	35x40	
12,000 (123)	4.50				35x45 *	
15,000 (153)	4.80				35x50 *	

Working Voltage (code)		63V (1J) – (SV) 79V				
Cap. (μF) (code)	Ripple Current	Case size øD x L 9mm)				
		B	C	D	E	
1,200 (122)	1.40	22x25				
1,500 (152)	1.50	22x30				
1,800 (182)	1.70	22x30	25x25			
2,200 (222)	2.00	22x35	25x30			
2,700 (272)	2.20	22x40	25x35	30x25		
3,300 (332)	2.50	22x50	25x40	30x30	35x25	
3,900 (392)	2.70		25x45	30x35	35x30	
4,700 (472)	3.00		25x50	30x40	35x30	
5,600 (562)	3.30			30x45	35x35	
6,800 (682)	3.60			30x50	35x40	
8,200 (822)	3.90				35x45 *	
10,000 (103)	4.40				35x50 *	

Working Voltage (code)		80V (1K) – (SV) 100V				
Cap. (μF) (code)	Ripple Current	Case size øD x L 9mm)				
		B	C	D	E	
820 (821)	1.20	22x25				
1,000 (102)	1.30	22x30	25x25			
1,200 (122)	1.50	22x30	25x25			
1,500 (152)	1.70	22x35	25x30			
1,800 (182)	1.80	22x40	25x35	30x25		
2,200 (222)	2.10	22x45	25x35	30x30	35x25	
2,700 (272)	2.40		25x45	30x35	35x30	
3,300 (332)	2.60		25x50	30x40	35x30	
3,900 (392)	3.00			30x45	35x35	
4,700 (472)	3.30			30x50	35x40	
5,600 (562)	3.70				35x45 *	
6,800 (682)	3.90				35x50 *	

Working Voltage (code)		100V (2A) – (SV) 125V				
Cap. (μF) (code)	Ripple Current	Case size øD x L 9mm)				
		B	C	D	E	
560 (561)	1.10	22x25				
820 (821)	1.40	22x30	25x25			
1,000 (102)	1.70	22x35	25x30			
1,200 (122)	1.80	22x40	25x35	30x25		
1,500 (152)	2.10	22x45	25x40	30x30	35x25	
1,800 (182)	2.30		25x45	30x35	35x30	
2,200 (222)	2.60		25x50	30x40	35x30	
2,700 (272)	2.90			30x45	35x35	
3,300 (332)	3.20			30x50	35x40	
3,900 (392)	3.60				35x45 *	
4,700 (472)	3.80				35x50 *	

Working Voltage (code)		160V (2C) – (SV) 200V				
Cap. (μF) (code)	Ripple Current	Case size øD x L 9mm)				
		B	C	D	E	
270 (271)	1.10	22x25				
330 (331)	1.20	22x30				
390 (391)	1.30	22x30	25x25			
470 (471)	1.40	22x35	25x30			
560 (561)	1.50	22x40	25x30	30x25		
680 (681)	1.70	22x45	25x35	30x30		
820 (821)	2.00		25x40	30x30		
1,000 (102)	2.20		25x45	30x35		
1,200 (122)	2.30		25x50	30x40		
1,500 (152)	2.50			30x45	35x35	
1,800 (182)	2.70			30x50	35x40	
2,200 (222)	2.90				35x50 *	

Working Voltage (code)		180V (2P) – (SV) 225V				
Cap. (μF) (code)	Ripple Current	Case size øD x L 9mm)				
		B	C	D	E	
220 (221)	1.00	22x25				
270 (271)	1.10	22x25				
330 (331)	1.20	22x30	25x25			
390 (391)	1.30	22x30	25x25			
470 (471)	1.40	22x35	25x30	30x25		
560 (561)	1.50	22x40	25x35	30x25		
680 (681)	1.70	22x50	25x40	30x30		
820 (821)	2.00		25x45	30x35	35x30	
1,000 (102)	2.20			30x40	35x30	
1,200 (122)	2.30			30x45	35x35	
1,500 (152)	2.50			30x50	35x45	
1,800 (182)	2.70				35x45 *	
2,200 (222)	2.90				35x50 *	

\* When capacitors of ø35x45L and ø35x50L are mounted on PWB, reinforce them with mounting clamp or adhesives. (Avoid using adhesives including halogenated compositions.)

### ■ Case Size/Ripple Current (cont'd)

(A) rms (120 Hz/+105°C)

Working Voltage (code)		200 V (2D) – (SV) 250V			
Cap. (μF) (code)	Ripple Current	Case size øD x L 9mm)			
		B	C	D	E
220 (221)	1.00	22x25			
270 (271)	1.10	22x30	25x25		
330 (331)	1.20	22x30	25x25		
390 (391)	1.30	22x35	25x30	30x25	
470 (471)	1.40	22x40	25x35	30x25	
560 (561)	1.50	22x45	25x35	30x30	
680 (681)	1.70		25x40	30x30	
820 (821)	2.00		25x50	30x35	35x30
1,000 (102)	2.20			30x45	35x35
1,200 (122)	2.30			30x50	35x40
1,500 (152)	2.50				35x50 *

Working Voltage (code)		250V (2E) – (SV) 300V			
Cap. (μF) (code)	Ripple Current	Case size øD x L 9mm)			
		B	C	D	E
180 (181)	0.90	22x30	25x25		
220 (221)	1.00	22x30	25x25		
270 (271)	1.10	22x35	25x30	30x25	
330 (331)	1.20	22x40	25x35	30x25	
390 (391)	1.30	22x45	25x35	30x30	
470 (471)	1.40		25x45	30x35	35x30
560 (561)	1.50		25x50	30x35	35x30
680 (681)	1.70			30x45	35x35
820 (821)	2.00			30x50	35x40
1,000 (102)	2.20				35x45 *
1,200 (122)	2.30				35x50 *

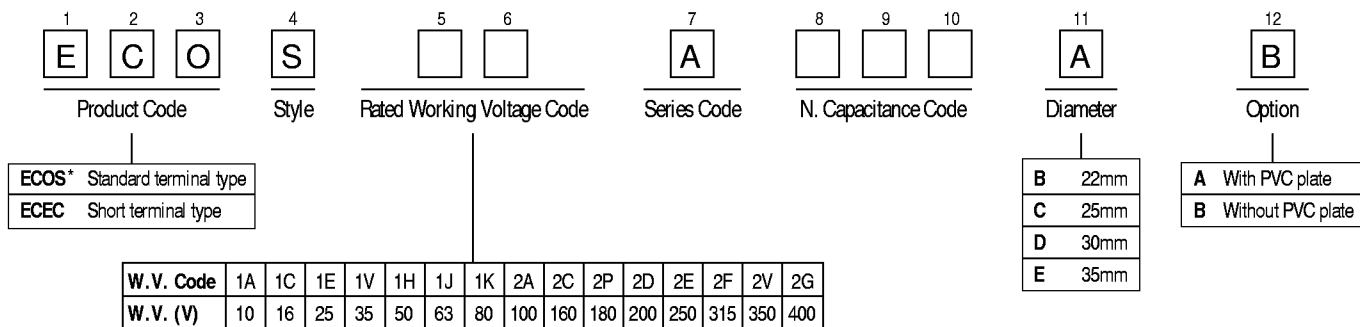
Working Voltage (code)		315V (2F) – (SV) 365V			
Cap. (μF) (code)	Ripple Current	Case size øD x L 9mm)			
		B	C	D	E
82 (820)	0.64	22x25			
100 (101)	0.69	22x30			
120 (121)	0.75	22x30	25x25		
150 (151)	0.82	22x35	25x30	30x25	
180 (181)	0.90	22x40	25x35	30x25	
220 (221)	1.00	22x45	25x40	30x30	
270 (271)	1.10		25x45	30x35	35x30
330 (331)	1.20		25x50	30x40	35x30
390 (391)	1.30			30x45	35x35
470 (471)	1.40			30x50	35x40
560 (561)	1.50				35x45 *
680 (681)	1.70				35x50 *

Working Voltage (code)		350V (2V) – (SV) 400V			
Cap. (μF) (code)	Ripple Current	Case size øD x L 9mm)			
		B	C	D	E
82 (820)	0.64	22x25			
100 (101)	0.69	22x30	25x25		
120 (121)	0.75	22x35	25x30		
150 (151)	0.82	22x40	25x30	30x25	
180 (181)	0.90	22x45	25x35	30x30	
220 (221)	1.00	22x50	25x40	30x30	
270 (271)	1.10		25x50	30x35	35x30
330 (331)	1.20			30x45	35x35
390 (391)	1.30			30x50	35x40
470 (471)	1.40				35x40
560 (561)	1.50				35x50 *

Working Voltage (code)		400V (2G) – (SV) 450V			
Cap. (μF) (code)	Ripple Current	Case size øD x L 9mm)			
		B	C	D	E
56 (560)	0.51	22x25			
68 (680)	0.56	22x30	25x25		
82 (820)	0.64	22x35	25x25		
100 (101)	0.69	22x35	25x30		
120 (121)	0.75	22x40	25x35	30x25	
150 (151)	0.82	22x50	25x40	30x30	
180 (181)	0.90		25x45	30x35	35x25
220 (221)	1.00		25x50	30x40	35x30
270 (271)	1.10			30x45	35x35
330 (331)	1.20			30x50	35x40
390 (391)	1.30				35x45 *
470 (471)	1.40				35x50 *

\* When capacitors of ø35x45L and ø35x50L are mounted on PWB, reinforce them with mounting clamp or adhesives. (Avoid using adhesives including halogenated compositions.)

### ■ Explanation of Part Numbers



\* Our product code will be changed from ECO to ECE during April 1996 to March 1998. We will inform the revision date before our change.

### ■ Case Size/Ripple Current

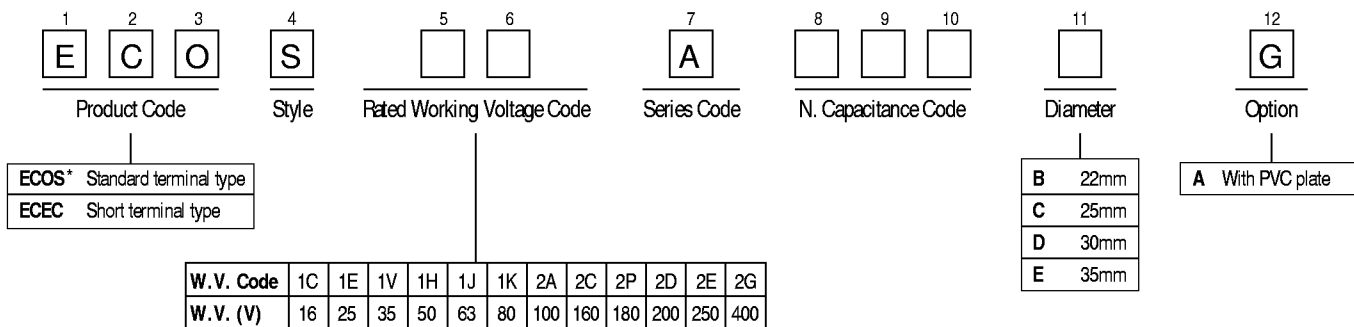
(A) rms (120 Hz/+85°C)

Case Size øD x L (mm)	Rated Working Voltage									
	10V (1)		16V (1C)		25V (1E)		35V (1V)		25V (1H)	
	Cap. (μF)	Ripple Current	Cap. (μF)	Ripple Current	Cap. (μF)	Ripple Current	Cap. (μF)	Ripple Current	Cap. (μF)	Ripple Current
20 x 25	6,800	1.30								
20 x 30	8200	1.60	6,800	2.20	4,700	2.00	3,300	1.90	1,800	1.50
	10,000	1.80								
20 x 35	12,000	2.20	8,200	2.40	5,600	2.20	3,900	2.00	2,200	1.70
20 x 40	15,000	2.30	10,000	2.60	6,800	2.40	4,700	2.20	2,700	1.80

Case Size øD x L (mm)	Rated Working Voltage									
	63V (1J)		80V (1K)		100V (2A)		160V (2C)		180V (2P)	
	Cap. (μF)	Ripple Current	Cap. (μF)	Ripple Current	Cap. (μF)	Ripple Current	Cap. (μF)	Ripple Current	Cap. (μF)	Ripple Current
20 x 25							220	1.00		
20 x 30	1,200	1.40	820	1.20	560	1.10	270	1.10	220	1.10
20 x 35	1,500	1.50	1,000	1.30	820	1.40	330	1.20	270	1.10
20 x 40	1,800	1.70	1,200	1.50	1,000	1.70	390	1.30		

Case Size øD x L (mm)	Rated Working Voltage									
	200V (2D)		250V (2E)		315V (2F)		350V (2V)		400V (2G)	
	Cap. (μF)	Ripple Current	Cap. (μF)	Ripple Current	Cap. (μF)	Ripple Current	Cap. (μF)	Ripple Current	Cap. (μF)	Ripple Current
20 x 25							68	0.56		
20 x 30	220	1.10			82	0.64	82	0.64	56	0.51
20 x 35	270	1.10	180	0.90	100	0.69	100	0.69	68	0.56
20 x 40	330	1.20	220	1.00	120	0.75	120	0.75	82	0.64

### ■ Explanation of Part Numbers



\* Our product code will be changed from ECO to ECE during April 1996 to March 1998. We will inform the revision date before our change.

### ■ Case Size/Ripple Current

(A) rms (120 Hz/+85°C)

Case Size øD x L (mm)	Rated Working Voltage									
	16V (1C)		25V (1E)		35V (1V)		50V (1H)		63V (1J)	
	Cap. (μF)	Ripple Current	Cap. (μF)	Ripple Current	Cap. (μF)	Ripple Current	Cap. (μF)	Ripple Current	Cap. (μF)	Ripple Current
22 x 20	3,300	1.30	2,200	1.30	1,500	1.10	1,000	0.90	680	0.90
25 x 20	4,700	1.60	3,300	1.60	2,200	1.40	1,500	1.20	1,000	1.20
30 x 25	6,800	1.80	4,700	1.80	3,300	1.70	2,200	1.40	1,500	1.30
35 x 20	10,000	2.40	6,800	2.30	4,700	2.00	3,300	1.70	2,200	1.50

Case Size øD x L (mm)	Rated Working Voltage									
	80V (1K)		100V (2A)		160V (2C)		180V (2P)		200V (2D)	
	Cap. (μF)	Ripple Current	Cap. (μF)	Ripple Current	Cap. (μF)	Ripple Current	Cap. (μF)	Ripple Current	Cap. (μF)	Ripple Current
22 x 20	470	0.80	330	0.80	150	0.55	120	0.50	100	0.50
25 x 20	680	1.00	470	1.00	220	0.75	180	0.70	150	0.65
30 x 20	1,000	1.20	680	1.10	330	1.00	270	0.87	220	0.87
35 x 20	1,500	1.40	1,000	1.20	470	1.15	390	1.00	330	1.10

Case Size øD x L (mm)	Rated Working Voltage			
	250V (1K)		400V (2A)	
	Cap. (μF)	Ripple Current	Cap. (μF)	Ripple Current
22 x 20	68	0.40	33	0.20
25 x 20	100	0.50	47	0.25
30 x 20	150	0.65	68	0.35
35 x 20	220	0.67	100	0.47