

## HL Series Low ESR, Snap-in Type

### Features

- ◆ Highly reliable capacitors that withstand low ESR & long life.
- ◆ Two or three dimensions with same ratings.
- ◆ For detail specifications, please refer to Engineering Bulletin No. E128
- ◆ RoHS Compliant



### Specifications

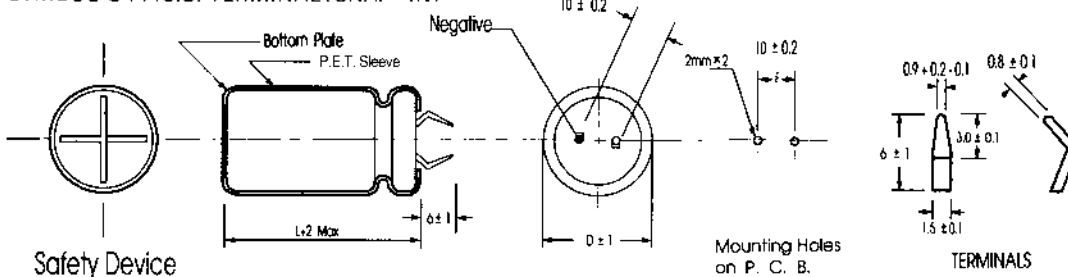
Item	Performance Characteristics										
Operating Temperature Range	-40 to +105°C	-25 to +105°C									
Rated Voltage Range	10 to 100 VDC	160 to 400 VDC									
Capacitance Range	560 to 47000 µF	56 to 1500 µF									
Capacitance Tolerance	±20% (120Hz, +20°C)										
Leakage Current (+20°C, max.)	I ≤ 0.02CV After 5 minutes with rated working voltage applied.										
Dissipation Factor (tan δ , at 20°C , 120Hz)	Less than the value under table (%)										
	Working Voltage(VDC)	10	16	25	35	50	63	80	100	160 ~ 250	350 ~ 400
Low Temperature Characteristics (at 120Hz)	Impedance ratio max.										
	Working voltage (VDC)	10 , 16	25	35	50 , 63	80 , 100	160 to 400				
	Z -25°C / Z +20°C	4	3	3	2	2	4				
Load Life	Test conditions										
	Duration time	:5000 Hrs									
Shelf Life	Test conditions										
	Duration time	:1000 Hrs									
After test requirement at +20°C											
Capacitance change : ≤ ±25% of the initial measured value											
Dissipation factor : ≤ 250% of the initial specified value											
Leakage current : ≤ The initial specified value											
After test requirement at +20°C : The same limits as Load life.											
Pre-treatment for measurements shall be conducted after application of DC working voltage for 30 minutes.											

### Multiplier for Ripple Current vs. Frequency

VDC\Frequency(Hz)	50	120	300	1K	10K	50K
10~50 WV	0.95	1	1.03	1.05	1.08	1.08
63~100 WV	0.93	1	1.07	1.13	1.19	1.20
160,250 WV	0.81	1	1.17	1.32	1.45	1.50
350,400 WV	0.77	1	1.16	1.30	1.41	1.43

### Diagram of Dimensions:(unit:mm)

SYMBOL G : P.C.B. TERMINAL (SNAP-IN)



## Case Size

WV(SV) φ D Cap (μF)		10 (13)											φ DxL(mm)	
		22			25			30			35			
		Size	Ripple	ESR	Size	Ripple	ESR	Size	Ripple	ESR	Size	Ripple	ESR	
5600	22x26	1.10	126											
6800	22x26	1.30	126	25x26	1.30	88								
8200	22x26	1.56	126	25x26	1.56	88								
10000	22x31	1.60	98	25x26	1.60	88	30x26	1.60	75					
12000	22x36	1.80	82	25x31	1.80	78	30x26	1.80	75					
15000	22x36	2.10	82	25x31	2.10	68	30x26	2.10	75					
18000	22x36	2.20	82	25x31	2.20	68	30x31	2.20	65					
22000	22x41	2.75	68	25x36	2.75	62	30x31	2.75	48	35x27	2.75	68		
27000				25x51	3.05	41	30x41	3.05	30	35x32	3.05	47		
33000				25x51	3.40	41	30x41	3.40	30	35x37	3.40	37		
39000							30x51	3.60	28	35x41	3.60	31		
47000							30x51	4.60	28	35x52	4.60	25		

WV(SV) φ D Cap (μF)		16 (20)											
		22			25			30			35		
		Size	Ripple	ESR	Size	Ripple	ESR	Size	Ripple	ESR	Size	Ripple	ESR
5600	22x26	1.40	126										
6800	22x31	1.60	98	25x26	1.60	88							
8200	22x36	1.80	82	25x31	1.80	75							
10000	22x41	2.10	68	25x31	2.10	68	30x26	2.10	75				
12000	22x41	2.40	68	25x36	2.40	52	30x26	2.40	75				
15000	22x51	2.70	53	25x41	2.70	52	30x31	2.70	48				
18000				25x51	3.05	41	30x36	3.05	36	35x32	3.05	47	
22000				25x51	3.40	41	30x41	3.40	30	35x47	3.40	37	
27000							30x51	4.02	28	35x42	4.02	31	
33000							30x51	4.32	28	35x42	4.32	31	
39000										35x52	4.95	25	

WV(SV) φ D Cap (μF)		25 (32)											
		22			25			30			35		
		Size	Ripple	ESR	Size	Ripple	ESR	Size	Ripple	ESR	Size	Ripple	ESR
3900	22x26	1.30	126										
4700	22x31	1.50	98	25x26	1.50	88							
5600	22x36	1.60	82	25x26	1.60	88							
6800	22x41	1.87	68	25x31	1.87	68	30x26	1.87	75				
8200	22x46	2.20	62	25x36	2.20	62	30x31	2.20	48	35x27	2.20	68	
10000	22x51	2.35	41	25x41	2.35	52	30x36	2.35	36	35x32	2.35	60	
12000				25x51	2.70	41	30x36	2.70	36	35x32	2.70	47	
15000							30x41	3.15	30	35x37	3.15	37	
18000							30x51	3.60	28	35x42	3.60	31	
22000										35x47	3.90	29	
27000										35x52	4.60	25	

WV(SV) φ D Cap (μF)		35 (44)											
		22			25			30			35		
		Size	Ripple	ESR	Size	Ripple	ESR	Size	Ripple	ESR	Size	Ripple	ESR
2200	22x26	1.10	126										
2700	22x26	1.29	126										
3300	22x31	1.40	98	25x26	1.40	88							
3900	22x36	1.55	82	25x31	1.55	68							
4700	22x41	1.75	68	25x31	1.75	68	30x26	1.75	75				
5600	22x46	1.95	62	25x36	1.95	62	30x31	1.95	48	35x27	1.95	68	
6800	22x51	2.20	53	25x41	2.20	52	30x36	2.20	36	35x32	2.20	60	
8200				25x51	2.50	41	30x36	2.50	36	35x32	2.50	47	
10000							30x41	2.80	30	35x37	2.80	37	
12000							30x51	3.30	28	35x42	3.30	31	
15000										35x52	4.25	25	

Ripple Current (A, rms) at 105°C 120Hz  
Max ESR (mΩ) at 20°C 30KHz

φ DxL(mm)

Cap (μF)	WV(SV)	φ D	50 (63)											
			22			25			30			35		
			Size	Ripple	ESR	Size	Ripple	ESR	Size	Ripple	ESR	Size	Ripple	ESR
1500		22x26	1.00	126										
1800		22x31	1.10	98	25x26	1.10	88							
2200		22x36	1.30	82	25x26	1.30	88							
2700		22x41	1.45	68	25x31	1.45	68	30x26	1.45	75				
3300		22x41	1.70	68	25x36	1.70	62	30x31	1.70	48				
3900		22x51	1.90	53	25x41	1.90	52	30x36	1.90	36				
4700					25x41	2.10	52	30x36	2.10	36	35x32	2.10	47	
5600					25x51	2.36	41	30x41	2.36	30	35x37	2.36	37	
6800								30x51	2.70	28	35x42	2.70	31	
8200								30x51	3.16	28	35x42	3.16	31	
10000											35x52	3.50	25	

Cap (μF)	WV(SV)	φ D	63 (79)											
			22			25			30			35		
			Size	Ripple	ESR	Size	Ripple	ESR	Size	Ripple	ESR	Size	Ripple	ESR
1000		22x26	1.00	126										
1200		22x26	1.15	126	25x26	1.15	88							
1500		22x36	1.30	82	25x31	1.30	68							
1800		22x41	1.45	68	25x31	1.45	68	30x26	1.45	75				
2200		22x46	1.65	62	25x36	1.65	62	30x31	1.65	48	35x27	1.65	68	
2700		22x51	1.90	53	25x41	1.90	52	30x36	1.90	36	35x32	1.90	60	
3300					25x51	2.15	41	30x36	2.15	36	35x32	2.15	47	
3900								30x41	2.40	30	35x37	2.40	37	
4700								30x51	2.70	28	35x42	2.70	31	
5600								30x51	3.10	28	35x42	3.10	31	
6800											35x52	3.50	25	

Cap (μF)	WV(SV)	φ D	80 (100)											
			22			25			30			35		
			Size	Ripple	ESR	Size	Ripple	ESR	Size	Ripple	ESR	Size	Ripple	ESR
680		22x26	0.95	148										
820		22x31	1.00	118										
1000		22x36	1.20	98	25x26	1.20	115							
1200		22x41	1.40	78	25x31	1.40	80							
1500		22x46	1.60	48	25x36	1.60	65	30x26	1.60	82				
1800		22x51	1.80	58	25x41	1.80	62	30x31	1.80	58	35x27	1.80	68	
2200					25x51	2.05	43	30x36	2.05	52	35x32	2.05	48	
2700								30x41	2.35	41	35x37	2.35	42	
3300								30x51	2.70	28	35x42	2.70	28	
3900											35x47	2.80	26	
4700											35x52	3.40	22	

Cap (μF)	WV(SV)	φ D	100 (125)											
			22			25			30			35		
			Size	Ripple	ESR	Size	Ripple	ESR	Size	Ripple	ESR	Size	Ripple	ESR
560		22x31	0.95	118	25x26	0.95	115							
680		22x36	1.10	98	25x31	1.10	80							
820		22x41	1.40	78	25x31	1.40	80	30x26	1.40	82				
1000		22x46	1.40	75	25x36	1.40	65	30x31	1.40	58	35x27	1.40	68	
1200		22x51	1.60	58	25x41	1.60	62	30x36	1.60	52	35x32	1.60	65	
1500					25x51	1.85	43	30x41	1.85	41	35x32	1.85	48	
1800								30x46	2.05	37	35x37	2.05	42	
2200								30x51	2.40	28	35x42	2.40	28	
2700											35x52	2.80	22	

Ripple Current (A, rms) at 105°C 120Hz

Max ESR (mΩ) at 20°C 30KHz

φ DxL(mm)

Cap (μF)	WV(SV) φ D	160 (200)											
		22			25			30			35		
		Size	Ripple	ESR	Size	Ripple	ESR	Size	Ripple	ESR	Size	Ripple	ESR
270		22x31	0.60	565									
330		22x36	0.80	455	25x26	0.80	525						
390		22x36	0.85	455	25x31	0.85	415						
470		22x46	1.10	380	25x36	1.10	365	30x31	1.10	315			
560		22x46	1.16	380	25x36	1.16	300	30x31	1.16	315			
680					25x46	1.30	280	30x36	1.30	262			
820					25x46	1.43	280	30x41	1.43	345	35x32	1.43	255
1000								30x46	1.69	300	35x37	1.69	205
1200											35x47	1.95	165
1500											35x52	2.40	145

Cap (μF)	WV(SV) φ D	200 (250)											
		22			25			30			35		
		Size	Ripple	ESR	Size	Ripple	ESR	Size	Ripple	ESR	Size	Ripple	ESR
180		22x26	0.57	645									
220		22x31	0.65	565									
270		22x36	0.78	455	25x26	0.78	525						
330		22x41	0.90	405	25x31	0.90	415						
390		22x41	0.98	405	25x36	0.98	405	30x26	0.98	405			
470		22x41	1.15	405	25x36	1.15	405	30x26	1.15	405			
560		22x46	1.30	345	25x36	1.30	365	30x26	1.30	405			
680		22x51	1.45	315	25x41	1.45	300	30x31	1.45	315	35x27	1.45	345
820					25x46	1.60	300	30x36	1.60	362	35x37	1.60	285
1000					25x56	1.90	235	30x46	1.90	300	35x37	1.90	205
1200								30x51	2.10	173	35x42	2.10	175

Cap (μF)	WV(SV) φ D	250 (300)											
		22			25			30			35		
		Size	Ripple	ESR	Size	Ripple	ESR	Size	Ripple	ESR	Size	Ripple	ESR
150		22x26	0.52	645									
180		22x31	0.64	565	25x26	0.64	525						
220		22x36	0.75	455	25x31	0.75	415						
270		22x41	0.85	405	25x31	0.85	415	30x26	0.85	405			
330		22x46	1.00	380	25x36	1.00	365	30x31	1.00	315	35x27	1.00	345
390		22x51	1.10	315	25x41	1.10	300	30x36	1.10	262			
470					25x51	1.20	235	30x36	1.20	262	35x32	1.20	255
560								30x41	1.35	345	35x37	1.35	205
680								30x51	1.55	173	35x42	1.55	175
820								30x56	1.70	300			
1000											35x52	2.00	145

Cap (μF)	WV(SV) φ D	350 (400)											
		22			25			30			35		
		Size	Ripple	ESR	Size	Ripple	ESR	Size	Ripple	ESR	Size	Ripple	ESR
68		22x26	0.34	795									
82		22x31	0.40	705									
100		22x36	0.50	565	25x26	0.50	655						
120		22x41	0.56	505	25x31	0.56	525	30x26	0.56	495			
150		22x46	0.63	460	25x36	0.63	435	30x31	0.63	395			
180		22x51	0.70	385	25x41	0.70	375	30x31	0.70	395			
220					25x51	0.82	305	30x36	0.82	325	35x32	0.82	310
270								30x41	0.90	285	35x37	0.90	250
330								30x51	1.10	215	35x42	1.10	225
390											35x47	1.20	210
470											35x52	1.30	175

Ripple Current (A, rms) at 105°C 120Hz

Max ESR (mΩ) at 20°C 30KHz

φ DxL(mm)

Cap (μF)	WV(SV)	400 (450)											
		22			25			30			35		
		Size	Ripple	ESR	Size	Ripple	ESR	Size	Ripple	ESR	Size	Ripple	ESR
56		22x26	0.32	795									
68		22x31	0.40	705	25x26	0.40	656						
82		22x36	0.45	565	25x31	0.45	525						
100		22x41	0.50	505	25x31	0.50	525	30x26	0.50	495			
120		22x41	0.55	505	25x36	0.55	435	30x31	0.55	395			
150		22x51	0.65	385	25x41	0.65	375	30x36	0.65	325			
180					25x46	0.75	350	30x36	0.75	325	35x32	0.75	310
220					25x51	0.85	305	30x41	0.85	285	35x37	0.85	250
270								30x51	1.05	215	35x42	1.05	225
330											35x47	1.10	210
390											35x52	1.20	175

Ripple Current ( A, rms ) at 105°C 120Hz

Max ESR (mΩ) at 20°C 30KHz