HL2 · Snap-In · 12000 h/105 °C

Long Life

› Specifications · Spezifikationen

Items	Characteristics
Temperature range	-40°C ~ + 105°C
Capacitance tolerance (at 20°C)	Standard +/- 20%, -10%/+30% on request
Surge voltage	Repetitive max. 30 sec per 6 Minutes
Leakage current max. I_L (20°C, 5 min)	0.02 • C • V_r [µA] or 3 mA, which is smaller.
Useful life	12 000 hours at 105°C
Field failure rate	0.5 FIT = 0.5 • 10^{-9} Failures/hour
RoHS conform	Directive 2011/65/EU & (EU)2015/863
Specification / Vibration	JIS C 5101-4 / 0.75mm, 10...55Hz, 10g, 3x2h

› Outline Drawings · Bauformen

Refer to page 8 for available terminal shapes and dimensions. · Auf Seite 8 finden Sie die verfügbaren Bauformen und Maße.

› Product Code · Bestellbezeichnung

Example: Series HL2 · 400 V · 470 µF ± 20 % · 30 x 50 mm · 4-pin short · without plate

HL2 **2G** **471** **M** **X** **Z** **S7** **WPEC**

Type of series

Capacitance code

The first two digits are significant. The last digit indicates the number of following zeros in µF.

Terminal symbol code

- R: 2-pin terminal
- S: 4-pin terminal
- C: 2-pin short terminal
- X: 4-pin short terminal
- E: 3-pin short terminal

Outer design code

None:
PET sleeve and PVC plate

WPEC:
PET sleeve without plate

Others on request

Rated voltage Code

Code	Voltage
2D	200
2E	250
2G	400
420V	420
2W	450
2H	500

Capacitance tolerance

- M : ± 20%
- Q : -10% ~ +30%

Diameter Code

Code	ØD
W	20
X	22
Y	25
Z	30
A	35
B	40

Length Code

Code	L	Code	L
S1	20	S8	55
S2	25	S9	60
S3	30	S10	65
S4	35	S11	70
S5	40	S12	75
S6	45	S13	80
S7	50	S14	85

Rated VoltageCode (Surge Voltage) V_r [V DC]	Capacitance C_r [µF]	Ripple Current at 105°C/120Hz I_r [A RMS]	Ripple Current at 40°C/120Hz [A RMS]	ESR (typ) at 20°C/100Hz [mΩ]	Dissipation Factor at 20°C/100Hz Tan δ	DxL [mm]	Product Code # = variable value, see fixing code in the product code
200 VDC Code: 2D Surge Voltage 250 VDC	**220**	0.97	2.72	456	0.15	20x25	HL22D221M#WS2
	270	1.16	3.25	372	0.15	20x30	HL22D271M#WS3
	330	1.35	3.78	304	0.15	20x35	HL22D331M#WS4
		1.31	3.67	304	0.15	22x30	HL22D331M#XS3
		1.25	3.50	304	0.15	25x25	HL22D331M#YS2
	390	1.45	4.06	257	0.15	25x30	HL22D391M#YS3
	470	1.74	4.87	214	0.15	22x40	HL22D471M#XS5
		1.60	4.48	214	0.15	25x30	HL22D471M#YS3
		1.56	4.37	214	0.15	30x25	HL22D471M#ZS2
	560	1.99	5.57	179	0.15	22x45	HL22D561M#XS6
		1.84	5.15	179	0.15	25x35	HL22D561M#YS4
	680	2.12	5.94	148	0.15	25x40	HL22D681M#YS5
		1.99	5.57	148	0.15	30x30	HL22D681M#ZS3
	820	2.44	6.83	122	0.15	25x45	HL22D821M#YS6
		2.31	6.47	122	0.15	30x35	HL22D821M#ZS4
	1 000	2.67	7.48	100	0.15	30x40	HL22D102M#ZS5
		2.26	6.33	100	0.15	35x30	HL22D102M#AS3
	1 200	3.06	8.57	84	0.15	30x45	HL22D122M#ZS6
		2.60	7.28	84	0.15	35x35	HL22D122M#AS4
	1 500	3.04	8.51	67	0.15	35x40	HL22D152M#AS5
250 VDC Code: 2E Surge Voltage 300 VDC	**150**	0.8	2.24	496	0.15	20x25	HL22E151M#WS2
	180	0.94	2.63	413	0.15	20x30	HL22E181M#WS3
		0.9	2.52	413	0.15	22x25	HL22E181M#XS2
	220	1.03	2.88	338	0.15	20x30	HL22E221M#WS3
	270	1.22	3.42	275	0.15	20x35	HL22E271M#WS4
		1.13	3.16	275	0.15	25x25	HL22E271M#YS2
	330	1.39	3.89	225	0.15	22x35	HL22E331M#XS4
		1.33	3.72	225	0.15	25x30	HL22E331M#YS3
	390	1.58	4.42	191	0.15	22x40	HL22E391M#XS5
		1.53	4.28	191	0.15	25x35	HL22E391M#YS4
		1.43	4.00	191	0.15	30x25	HL22E391M#ZS2
	470	1.90	5.32	162	0.15	22x50	HL22E471M#XS7
		1.77	4.96	162	0.15	25x40	HL22E471M#YS5
		1.66	4.65	162	0.15	30x30	HL22E471M#ZS3
	560	2.02	5.66	136	0.15	25x45	HL22E561M#YS6
	680	2.32	6.50	112	0.15	25x50	HL22E681M#YS7
		2.10	5.88	112	0.15	30x35	HL22E681M#ZS4
	820	2.42	6.78	93	0.15	30x40	HL22E821M#ZS5
	1 000	2.90	8.12	76	0.15	30x50	HL22E102M#ZS7
	1 200	2.83	7.92	64	0.15	35x45	HL22E122M#AS6
	1 500	3.29	9.21	61	0.15	35x50	HL22E152M#AS7

Additional designs on request · Weitere Designs auf Anfrage

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Rated VoltageCode (Surge Voltage) V_r [V DC]	Capacitance C_r [µF]	Ripple Current at 105°C/120Hz I_r [A RMS]	Ripple Current at 40°C/120Hz [A RMS]	ESR (typ) at 20°C/100Hz [mΩ]	Dissipation Factor at 20°C/100Hz Tan δ	DxL [mm]	Product Code # = variable value, see fixing code in the product code
400 VDC Code: 2G Surge Voltage 450 VDC	**47**	0.46	1.29	1625	0.15	20x25	HL22G470M#WS2
	68	0.56	1.57	1121	0.15	20x25	HL22G680M#WS2
	82	0.64	1.79	1126	0.15	20x25	HL22G820M#WS2
	100	0.77	2.16	781	0.15	20x35	HL22G101M#WS4
		0.75	2.10	781	0.15	22x30	HL22G101M#XS3
		0.72	2.02	781	0.15	25x25	HL22G101M#YS2
	120	0.85	2.38	651	0.15	20x35	HL22G121M#WS4
		0.87	2.44	651	0.15	22x35	HL22G121M#XS4
		0.84	2.35	651	0.15	25x30	HL22G121M#YS3
	150	1.02	2.86	521	0.15	22x40	HL22G151M#XS5
		0.94	2.63	521	0.15	25x30	HL22G151M#YS3
		0.88	2.46	521	0.15	30x25	HL22G151M#ZS2
	180	1.18	3.30	475	0.15	22x45	HL22G181M#XS6
		1.09	3.05	475	0.15	25x35	HL22G181M#YS4
		1.02	2.86	475	0.15	30x30	HL22G181M#ZS3
	220	1.35	3.78	389	0.15	22x50	HL22G221M#XS7
		1.26	3.53	389	0.15	25x40	HL22G221M#YS5
		1.13	3.16	389	0.15	30x30	HL22G221M#ZS3
	270	1.46	4.09	317	0.15	25x45	HL22G271M#YS6
		1.33	3.72	317	0.15	30x35	HL22G271M#ZS4
		1.33	3.72	317	0.15	35x30	HL22G271M#AS3
	330	1.67	4.68	259	0.15	25x50	HL22G331M#YS7
		1.54	4.31	259	0.15	30x40	HL22G331M#ZS5
		1.54	4.31	259	0.15	35x35	HL22G331M#AS4
	390	1.75	4.90	219	0.15	30x45	HL22G391M#ZS6
		1.67	4.68	219	0.15	35x35	HL22G391M#AS4
		2.16	6.04	218	0.15	40x31	HL22G391M#BS3
	470	2.00	5.61	182	0.15	30x50	HL22G471M#ZS7
		1.92	5.38	182	0.15	35x40	HL22G471M#AS5
	560	2.19	6.13	156	0.15	35x45	HL22G561M#AS6
	680	2.51	7.02	126	0.15	35x50	HL22G681M#AS7
		2.44	6.84	130	0.15	40x40	HL22G681M#BS5
	820	2.98	8.35	105	0.15	35x70	HL22G821M#AS11
	1 000	3.48	9.73	86	0.15	35x80	HL22G102M#AS13
420 VDC Code: 420V Surge Voltage 470 VDC	**150**	0.94	2.63	570	0.15	30x30	HL2420V151M#ZS3
	180	1.08	3.02	475	0.15	30x35	HL2420V181M#ZS4
		1.08	3.02	475	0.15	35x30	HL2420V181M#AS3
	220	1.36	3.82	389	0.15	25x50	HL2420V221M#YS7
		1.20	3.36	389	0.15	30x35	HL2420V221M#ZS4
		1.20	3.36	389	0.15	35x30	HL2420V221M#AS3
	330	1.54	4.31	259	0.15	30x40	HL2420V331M#ZS5

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Rated VoltageCode (Surge Voltage) V_r [V DC]	Capacitance C_r [µF]	Ripple Current at 105°C/120Hz I_r [A RMS]	Ripple Current at 40°C/120Hz [A RMS]	ESR (typ) at 20°C/100Hz [mΩ]	Dissipation Factor at 20°C/100Hz Tan δ	DxL [mm]	Product Code # = variable value, see fixing code in the product code
450 VDC Code: 2W Surge Voltage 500 VDC	**47**	0.46	1.29	1820	0.15	20x25	HL22W470M#WS2
	56	0.55	1.54	1527	0.15	20x30	HL22W560M#WS3
		0.53	1.48	1527	0.15	22x25	HL22W560M#XS2
	68	0.60	1.68	1258	0.15	20x30	HL22W680M#WS3
		0.62	1.74	1258	0.15	22x30	HL22W680M#XS3
		0.59	1.65	1258	0.15	25x25	HL22W680M#YS2
	82	0.70	1.96	1043	0.15	20x35	HL22W820M#WS4
	100	0.79	2.21	855	0.15	22x35	HL22W101M#XS4
		0.72	2.00	855	0.15	25x25	HL22W101M#YS2
	120	0.91	2.55	713	0.15	22x40	HL22W121M#XS5
		0.88	2.46	713	0.15	25x35	HL22W121M#YS4
		0.79	2.21	713	0.15	30x25	HL22W121M#ZS2
	150	1.12	3.14	570	0.15	22x50	HL22W151M#XS7
		1.04	2.91	570	0.15	25x40	HL22W151M#YS5
		0.94	2.63	570	0.15	30x30	HL22W151M#ZS3
	180	1.19	3.33	475	0.15	25x45	HL22W181M#YS6
		1.08	3.02	475	0.15	30x35	HL22W181M#ZS4
	220	1.40	3.92	389	0.15	25x40	HL22W221M#YS5
		1.20	3.36	389	0.15	35x30	HL22W221M#AS3
	270	1.45	4.06	317	0.15	30x45	HL22W271M#ZS6
		1.40	3.92	317	0.15	35x35	HL22W271M#AS4
	330	1.67	4.68	259	0.15	30x50	HL22W331M#ZS7
		1.62	4.54	259	0.15	35x40	HL22W331M#AS5
	390	1.83	5.12	224	0.15	35x45	HL22W391M#AS6
	470	2.08	5.82	190	0.15	35x50	HL22W471M#AS7
500 VDC Code: 2H Surge Voltage 550 VDC	**100**	0.74	2.06	960	0.2	25x45	HL22H101M#YS6
	120	0.85	2.37	800	0.2	25x50	HL22H121M#YS7
		0.79	2.22	800	0.2	30x35	HL22H121M#ZS4
		0.79	2.22	800	0.2	35x30	HL22H121M#AS3
	150	0.94	2.62	640	0.2	30x40	HL22H151M#ZS5
		0.94	2.62	640	0.2	35x35	HL22H151M#AS4
	180	1.11	3.11	540	0.2	30x50	HL22H181M#ZS7
		1.07	2.99	540	0.2	35x40	HL22H181M#AS5
	220	1.23	3.45	440	0.2	35x45	HL22H221M#AS6
	270	1.42	3.97	360	0.2	35x50	HL22H271M#AS7
	330	1.56	4.37	340	0.2	35x60	HL22H331M#AS9
	390	1.94	5.43	250	0.2	40x61	HL22H391M#BS9

› Ripple Current Multiplier · Wechselstrommultiplikator

Frequency [Hz]	50/60	120	300	1k	≥ 10k
Multiplier	0.70	1.00	1.18	1.34	1.45

Forced cooling [m/sec]	v < 1.0	v ≥ 1.0
Multiplier	1.0	1.1

Temperature [°C]	40	60	70	85	105
Multiplier	2.8	2.4	2.1	2.0	1.0

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› Life Time Table · Brauchbarkeitsdauer – Tabelle

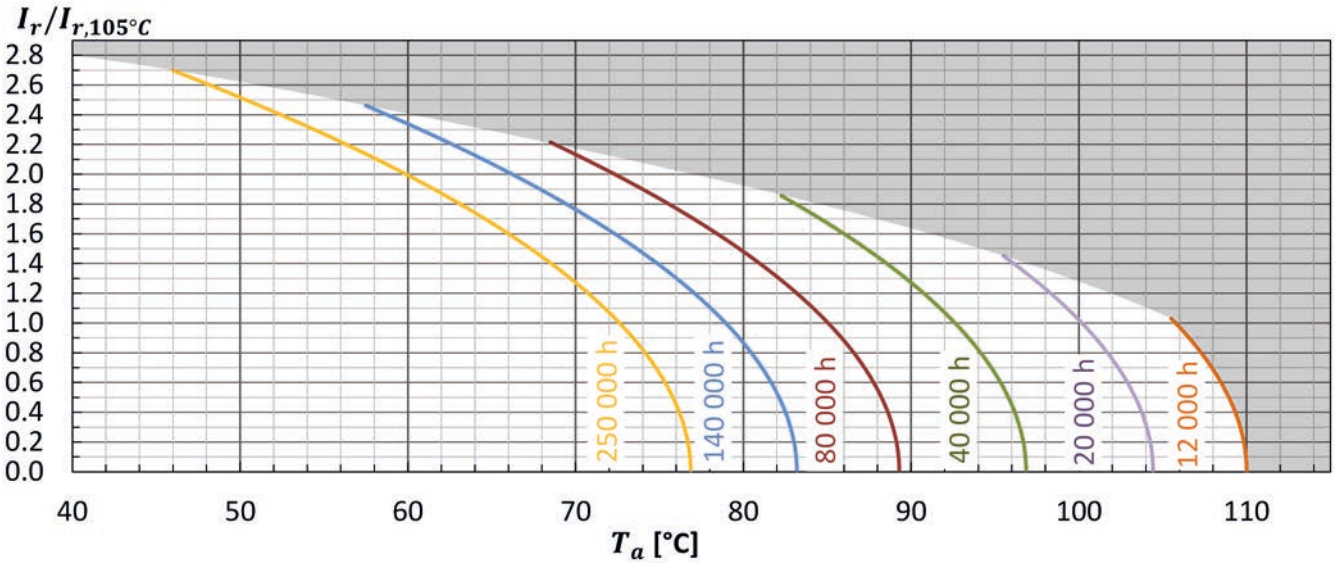
HL2	Useful life as function of ambient temperature and ripple current													
I_r at 105°C	x 1.0	x 1.2	x 1.4	x 1.6	x 1.8	x 2.0	x 2.1	x 2.2	x 2.3	x 2.4	x 2.5	x 2.6	x 2.7	x 2.8
T_a = 40°C	250	250	250	250	250	250	250	250	250	250	250	250	250	250
T_a = 45°C	250	250	250	250	250	250	250	250	250	250	250	250	250	
T_a = 50°C	250	250	250	250	250	250	250	250	250	250	250	211		
T_a = 55°C	250	250	250	250	250	250	250	250	237	198	163			
T_a = 60°C	250	250	250	250	250	248	211	179	150	125				
T_a = 65°C	250	250	250	250	210	156	133	113	94					
T_a = 70°C	250	250	219	173	133	99	84							
T_a = 75°C	201	169	138	109	84	62	53							
T_a = 80°C	127	107	87	69	53	39								
T_a = 85°C	80	67	55	43	33	25								
T_a = 90°C	50	42	35	27	21									
T_a = 95°C	32	27	22	17										
T_a = 100°C	20	17												
T_a = 105°C	12													

khrs Max. value limited to 250 000 hours.

› Life Time Graph · Brauchbarkeitsdauer – Diagramm

Useful life depending on ambient temperature T_a and ripple current operating conditions I_r versus rated ripple current at the upper category temperature $I_{r,\ 105°C,120Hz}$

Brauchbarkeitsdauer in Abhängigkeit von Umgebungstemperatur T_a und Wechselstrombelastung I_r im Verhältnis zur max. Wechselstrombelastung bei oberer Kategorietemperatur $I_{r,\ 105°C,120Hz}$



› Life Time Tests and Requirements · Anforderungen Brauchbarkeitsdauer

Life time test	Test procedure	Life time criteria
Endurance test	T_a = 105°C; V_r, I_r applied 8000 hours	ΔC/C ≤ 15% (of initial value) Tanδ ≤ 175% (of specified value) I_L ≤ specified value
Useful life	T_a = 105°C; V_r, I_r applied 12000 hours	ΔC/C ≤ 20% (of initial value) Tanδ < 200% (of specified value) I_L ≤ specified value

Reference Specification: JIS C 5101-4, JIS C 5102, IEC 60384-4