PEG 123

- Long Life, >12 years at 50°C
- Low ESR, down to 80 mΩ
- Low ESL, down to 3 nH
- Applicable up to 105°C

Application

Smoothing, coupling/decoupling and energy storage in power supplies, process control and measuring.

Due to the stability and the low leakage current this series also meets all the requirements for timing and integration.

Basic design

PEG 123 is a Long Life electrolytic capacitor, high reliability version, polarized, all-welded design, tinned copper wire leads, negative pole connected to the case, plastic insulation.

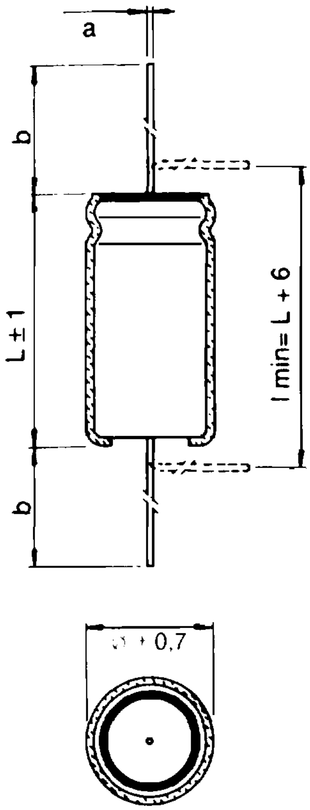
PEG 123 is designed as an economy range of PEG 124 and PEG 122 with performance exceeding that of the IEC 384-4 Long Life Grade.

The PEG 123 winding is housed in a cylindrical aluminium can with a high purity aluminium disc and a high quality rubber gasket.

The sealing system is designed for electrolyte leakage free operation and a low gas-diffusion rate of electrolyte, i.e. Long Life.

Thanks to their robust construction they are also suitable for use in mobile and in aircraft installations.

Ø 7.3–8.9	a = 0.64±0.03 mm
Ø 10–20	a = 0.80±0.03 mm
L1 (box)	b = 42 mm + 3–2
T1 (taped)	b = see page 96



Specification

Standards	IEC 384-4 Long Life Grade 40/85/56 DIN 41.240, type 1A DIN 40.040 GMF
Capacitance range	1–10,000 µF
Capacitance tolerance	–10 to +30%
Rated voltage	10–100 VDC
Temperature range	–40 to +85°C
Shelf life	at 0V, +85°C, 5,000 h +40°C, 10 years
Diameter range	7.3–20 mm

Technical data

Leakage current
Rated leakage current, I_{RL} (µA)
Rated voltage, U_R (V)
Rated capacitance, C_R (µF)

For $C_R \times U_R \leq 1000$
$I_{RL} = 0.01 \times C_R \times U_R$
For $C_R \times U_R > 1000$
$I_{RL} = 0.006 \times C_R \times U_R + 4$

Article table

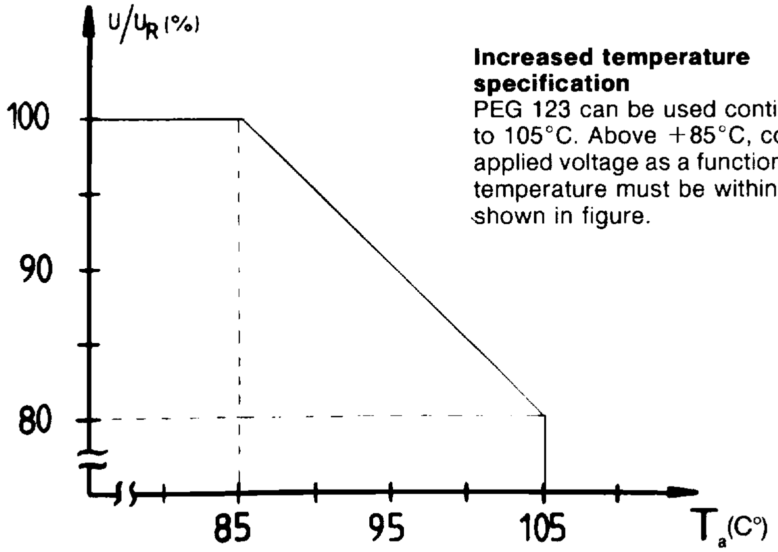
U_R	C_R µF	⌀ × L mm	Case code	I_{RAC}* 85°C 100 Hz mA	ESR* 20°C 100 Hz Ω	ESR* 20°C 100 kHz Ω	L_{ESL} Approx nH	Article code 1st block
	47	7.3×17.2	R	110	6.50	4.00	3	PEG 123ER2470
	100	7.3×17.2	R	120	5.20	4.00	3	PEG 123ER3100
	220	8.9×19.7	S	160	3.05	2.50	4	PEG 123ES3220
	470	10.0×20.0	A	230	1.50	1.20	5	PEG 123EA3470
10 VDC	1000	10.0×29.0	B	390	0.70	0.58	6	PEG 123EB4100
	2200	13.0×29.0	D	580	0.33	0.28	8	PEG 123ED4220
	4700	20.0×29.0	H	810	0.17	0.15	12	PEG 123EH4470
	10000	20.0×37.0	J	1700	0.09	0.08	15	PEG 123EJ5100
	22	7.3×17.2	R	90	9.40	4.00	3	PEG 123GR2220
	47	7.3×17.2	R	110	6.50	4.00	3	PEG 123GR2470
	100	7.3×17.2	R	120	5.20	4.08	3	PEG 123GR3100
	220	8.9×19.7	S	170	2.50	2.00	4	PEG 123GS3220
16 VDC	470	10.0×29.0	B	250	1.20	1.00	6	PEG 123GB3470
	1000	13.0×29.0	D	360	0.56	0.45	8	PEG 123GD4100
	2200	16.0×29.0	F	780	0.28	0.23	10	PEG 123GF4220
	3300	16.0×37.0	G	950	0.20	0.16	12	PEG 123GG4330
	4700	20.0×29.0	H	1270	0.16	0.12	12	PEG 123GH4470
	22	7.3×17.2	R	90	9.40	4.00	3	PEG 123HR2220
	47	7.3×17.2	R	109	6.50	4.00	3	PEG 123HR2470
	100	8.9×19.7	S	140	3.90	2.80	4	PEG 123HS3100
	220	10.0×20.0	A	200	1.80	1.30	5	PEG 123HA3220
25 VDC	470	10.0×29.0	B	360	0.84	0.60	6	PEG 123HB3470
	1000	13.0×29.0	D	600	0.40	0.30	8	PEG 123HD4100
	2200	16.0×37.0	G	1200	0.19	0.14	12	PEG 123HG4220
	10	7.3×17.2	R	72	15.00	4.00	3	PEG 123KR2100
	22	7.3×17.2	R	89	9.40	4.00	3	PEG 123KR2220
	47	7.3×17.2	R	110	6.50	4.00	3	PEG 123KR2470
	68	8.9×19.7	S	140	4.18	2.54	4	PEG 123KS2680
	100	8.9×19.7	S	160	2.84	3.92	4	PEG 123KS3100
40 VDC	220	10.0×29.0	B	260	1.15	0.65	6	PEG 123KB3220
	470	13.0×29.0	D	490	0.60	0.38	8	PEG 123KD3470
	1000	16.0×29.0	F	700	0.30	0.19	10	PEG 123KF4100
	1500	20.0×29.0	H	840	0.21	0.14	12	PEG 123KH4150
	2200	20.0×37.0	J	1350	0.15	0.10	15	PEG 123KJ4220
	4.7	7.3×17.2	R	50	30.40	4.00	3	PEG 123MR1470
	10	7.3×17.2	R	100	14.60	4.00	3	PEG 123MR2100
	22	7.3×17.2	R	130	8.50	4.00	3	PEG 123MR2220
	47	8.9×19.7	S	130	4.40	2.30	4	PEG 123MS2470
63 VDC	100	10.0×20.0	A	190	2.10	1.10	5	PEG 123MA3100
	220	10.0×29.0	B	340	1.00	0.50	6	PEG 123MB3220
	470	13.0×29.0	D	500	0.45	0.25	8	PEG 123MD3470
	680	16.0×29.0	F	740	0.33	0.18	10	PEG 123MF3680
	1000	20.0×29.0	H	1000	0.23	0.13	12	PEG 123MH4100
	1	7.3×17.2	R	23	145.00	20.00	3	PEG 123PR1100
	2.2	7.3×17.2	R	31	77.00	20.00	3	PEG 123PR1220
	4.7	7.3×17.2	R	41	46.60	20.00	3	PEG 123PR1470
	10	7.3×17.2	R	48	32.50	20.00	3	PEG 123PR2100
	22	8.9×19.7	S	80	15.60	11.60	4	PEG 123PS2220
100 VDC	47	10.0×20.0	A	120	7.30	5.40	5	PEG 123PA2470
	100	10.0×29.0	B	180	3.40	2.50	6	PEG 123PB3100
	220	16.0×29.0	F	340	1.57	1.18	10	PEG 123PF3220
	330	16.0×37.0	G	460	1.04	0.80	12	PEG 123PG3330
	470	20.0×37.0	J	620	0.75	0.56	15	PEG 123PJ3470

* Maximum values.

Operational data

Temperature, ripple current and operational life

The life of an electroclytic capacitor is mainly determined by the temperature in the hottest part of the winding, the so-called Hot Spot temperature (T_h). This temperature is found by taking the ambient temperature (T_a) and adding the capacitor temperature rise (T_h—T_a) due to its electrical power losses mainly caused by the ripple current load and equivalent series resistance (ESR). For a particular electrical power loss the magnitude of the capacitor temperature is determined by the cooling conditions and the thermal design of the capacitor. The operational life matrix shows minimum operational life (L_{OP}) as a function of ambient temperature(T_a), ripple current load factor (k_{AC}) and maximum expected capacitor case temperature (T_C) with natural convection cooling and operational frequency 100 Hz. End of life definition see. "Terms and definitions".



Increased temperature specification

PEG 123 can be used continuously up to 105°C. Above +85°C, continuously applied voltage as a function of ambient temperature must be within the limit shown in figure.

k_{AC} = ripple current load factor, I_{AC}/I_{RAC} (85°C; 100 Hz)

k_{AC}	0		0.6		1.0		1.2		1.4		1.6		1.8		2.0	
T_a	L_{OP}	T_C	L_{OP}	T_C	L_{OP}	T_C	L_{OP}	T_C	L_{OP}	T_C	L_{OP}	T_C	L_{OP}	T_C	L_{OP}	T_C
40	200	40	185	41	160	43	145	45	130	43	110	49	95	51	80	53
45	150	45	140	46	120	48	110	50	96	52	84	54	71	56	60	58
50	115	50	100	51	90	53	81	55	72	57	63	59	54	61	45	63
55	85	55	78	56	67	58	61	60	54	62	47	64	40	66	34	68
60	63	60	58	61	50	63	46	65	40	67	35	69	71	25	25	73
65	48	65	44	66	38	68	34	70	30	72	26	74	23	76	19	78
70	36	70	33	71	28	73	26	75	23	77	20	79	17	81	14	83
75	27	75	25	76	21	78	19	80	17	82	15	84	13	86	11	88
80	20	80	18	81	16	83	14	85	13	87	11	89	9	91	8	93
85	15	85	14	86	12	88	11	90	10	92	8	94	7	96	6	98
90	11	90	10	91	9	93	8	95	7	97	6	99	5	101		
95	8	95	8	96	7	98	6	100	5	102						
100	6	100	6	101	5	103										
105	5	105														

L_{OP} (thousand hours)

Note. The use of forced air cooling or chassis mounting increases the ripple current capability and operational life. However, the maximum case temperature (T_C) as stated in the vertical column under appropriate ripple current load factor (k_{AC}) must under no conditions be exceeded. The life (L_{OP}) can be estimated from the same column when (T_C) is known.

The above table is valid for case diameters ≤10 mm. For larger diameters multiply the L_{OP} figure with appropriate diameter correction factor (k_d).

Diameter correction factor (K_d)

∅ mm	K_d
≤10	1.0
13	1.2
16	1.8
20	2.7

Ripple current frequency dependence

The ESR value decreases with increased frequency allowing higher ripple current load for the same power loss and life. The rated ripple current values, as shown in the article table, must therefore be multiplied by the frequency correction factor (k_f) at other frequencies than 100 Hz.

Frequency f(Hz)	Frequency correction factor (k_f) 6.3–16 VDC	25–100 VDC
50	0.85	0.80
100	1.00	1.00
300	1.25	1.35
600	1.40	1.55
≧ 1500	1.50	1.65

Note: More accurate calculations can be done with the complete article data available. Please, ask your local representative.

Example, calculation of operational life

Capacitor
PEG 123 GD 4100 I_{RAC}(85°C, 100 Hz) = 360 mA

Working conditions
f = 20 kHz
T_a = 60°C
I_{AC}(60°C, 20 kHz) = 510 mA

Calculation
a) Frequency adjustment. 510/1.5 = 340 mA
b) I_{AC}(60°C, 100 Hz)/I_{RAC}(85°C, 100 Hz) = 340/360 = 0.94
c) Follow the 60°C row to k = 1
Multiply the L_{OP} figure with appropriate diameter correction factor 50.000×1.2 = 60.000 h.
The operational life is 60.000 h.

Reliability

The failure rate is derived from our periodic test results. The failure rate (λ_R) is therefore only given at test temperature for life tests. An estimation is also given at 60°C.

The expected failure rate for this capacitor range is based on our periodic test results for capacitors with structural similarity.

T_a	Failure rate per hour
85°C	2×10^{-7}
60°C	1×10^{-8}

Failure rate per hour for catastrophic plus parametric failures.

For more detailed information see "Application and operation information".

Ordering information

1st block (pos 1–13)	**2nd block** pos 14–20)
P E G 1 2 3 K D 3 4 7 0 Q	**T 1**
1 2 3 4 5 6 7 8 9 10 11 12 13	14 15 16 17 18 19 20

Standard
Case code A, B, C, D, R and S
T1: Taped delivery on reels
All other case codes:
L1: Packed in boxes
Capacitance tolerances:
Q: –10 to +30%

On request
Case code A, B, C and D:
L1: Packed in boxes
Other tolerances

Quantities and weights

CASE CODE	A	B	C	D	E	F	G	H	J	L	R	S
Weight approx (g)	3	4	4	6	7	9	11	13	20	24	1.3	1.8
Standard content per reel	500	500	400	400							1000	800
Standard box quantity[1]	(250)	(200)	(200)	(200)	100	100	100	100	100	100		

[1]Deliveries between ( ) on request.