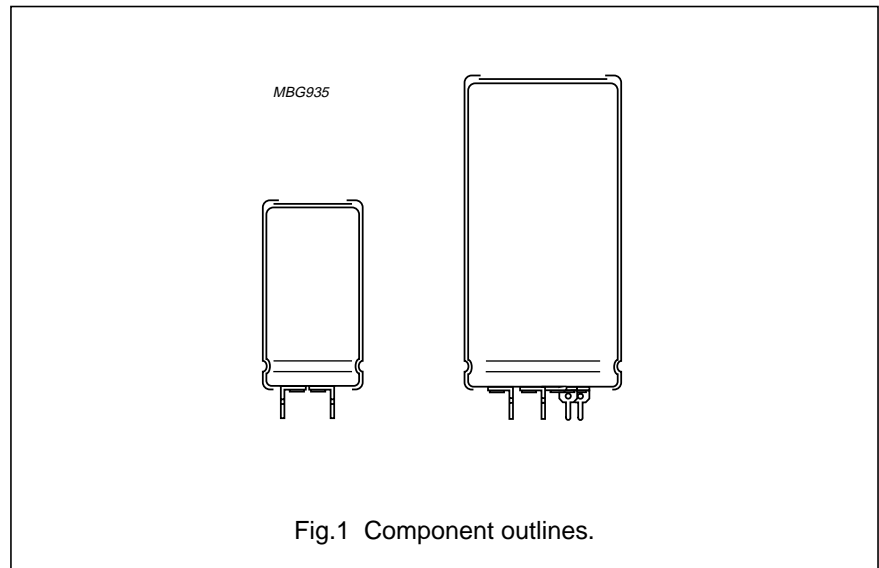


Non-solid Al - electrolytic capacitors Power Long Life Printed Wiring

PLL-PW 162/163

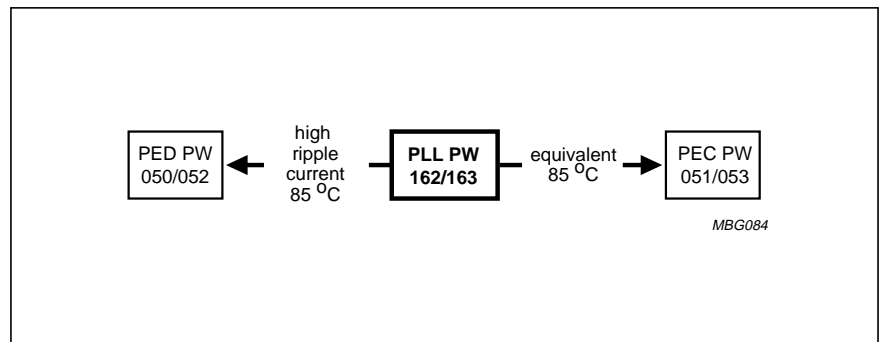
FEATURES

- Polarized aluminium electrolytic capacitors, non-solid
- Large types, minimized dimensions, cylindrical aluminium case, insulated with a blue sleeve
- Provided with keyed polarity
- Pressure relief on the top of the aluminium case
- Charge and discharge proof
- Very long useful life: 5000 hours at 105 °C
- Low ESR, high ripple current capability
- Temperature range up to 105 °C
- High resistance to shock and vibration.



APPLICATIONS

- Computer, telecommunication and industrial systems
- Smoothing and filtering
- Standard and switched mode power supplies
- Energy storage in pulse systems.



QUICK REFERENCE DATA

DESCRIPTION	VALUE	
	162	163
Case size ($\varnothing D_{nom} \times L_{nom}$ in mm)	25 × 30 to 40 × 100	
Rated capacitance range (E6 series), C_R	470 to 150000 μF	68 to 3300 μF
Tolerance on C_R	±20%	
Rated voltage range, U_R	10 to 100 V	200 to 400 V
Category temperature range	-40 to +105 °C	
Endurance test at 105 °C	2000 hours	
Useful life at 105 °C	5000 hours	
Useful life at 40 °C, $1.9 \times I_R$ applied	150000 hours	
Shelf life at 0 V, 105 °C	500 hours	
Based on sectional specification	IEC 384-4/CECC 30300	
Detail specification	similar to DIN 45910-T129, former DIN 41238	
Climatic category IEC 68	40/105/56	

Non-solid Al - electrolytic capacitors Power Long Life Printed Wiring

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Selection chart for C_R , U_R and relevant nominal case sizes ($\varnothing D \times L$ in mm) for 162 series

Preferred types in **bold**.

C_R (μF)	U_R (V)					
	10	16	25	40	63	100
470	–	–	–	–	–	25 × 30
680	–	–	–	–	–	25 × 40
1000	–	–	–	–	25 × 30	30 × 40
1500	–	–	–	–	25 × 40	35 × 40
2200	–	–	–	25 × 30	30 × 40	35 × 50
	–	–	–	–	–	40 × 40
3300	–	–	–	25 × 40	35 × 40	40 × 50
4700	–	–	25 × 30	30 × 40	35 × 50	40 × 70
	–	–	–	–	40 × 40	–
6800	–	25 × 30	25 × 40	35 × 40	40 × 50	40 × 100
10000	25 × 30	25 × 40	30 × 40	35 × 50	40 × 70	–
	–	–	–	40 × 40	–	–
15000	25 × 40	30 × 40	35 × 40	40 × 50	40 × 100	–
22000	30 × 40	35 × 40	35 × 50	40 × 70	–	–
	–	–	40 × 40	–	–	–
33000	35 × 40	35 × 50	40 × 50	40 × 100	–	–
	–	40 × 40	–	–	–	–
47000	35 × 50	40 × 50	40 × 70	–	–	–
	40 × 40	–	–	–	–	–
68000	40 × 50	40 × 70	40 × 100	–	–	–
100000	40 × 70	40 × 100	–	–	–	–
150000	40 × 100	–	–	–	–	–

Selection chart for C_R , U_R and relevant nominal case sizes ($\varnothing D \times L$ in mm) for 163 series

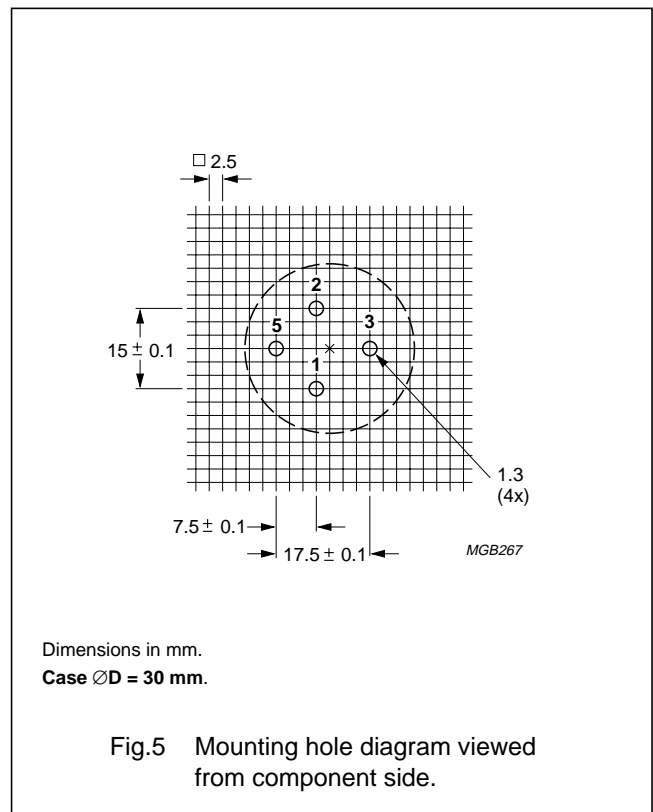
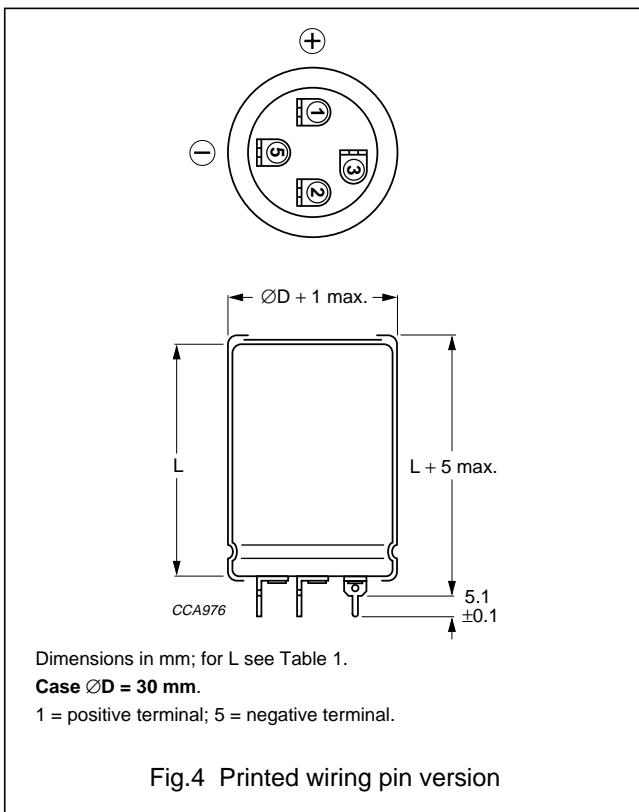
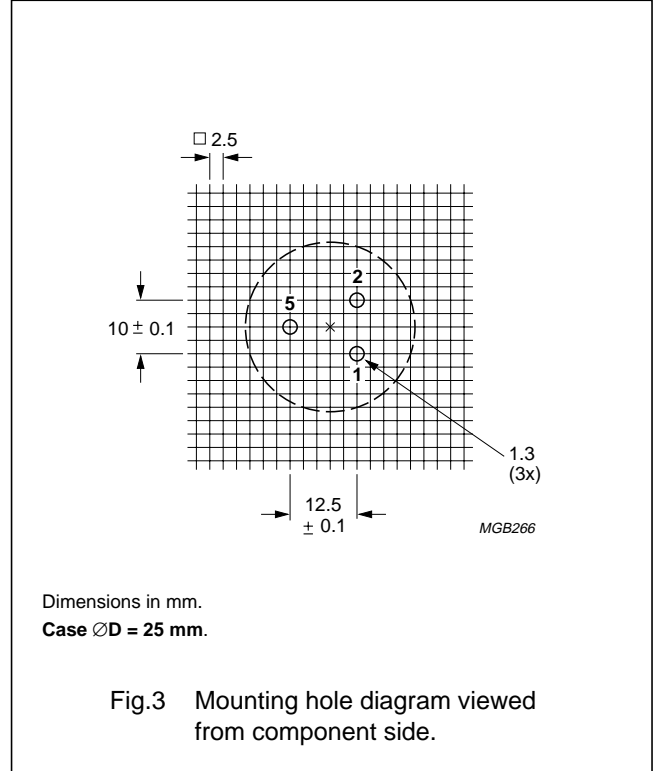
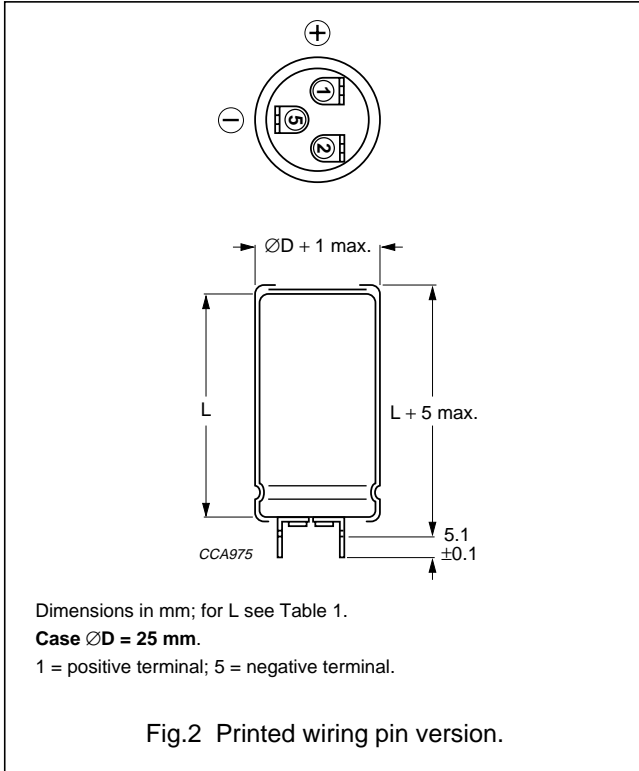
Preferred types in **bold**.

C_R (μF)	U_R (V)			
	200	250	385	400
68	–	–	25 × 30	25 × 30
100	–	25 × 30	25 × 40	25 × 40
150	25 × 30	25 × 40	30 × 40	30 × 40
220	25 × 40	30 × 40	35 × 40	35 × 40
330	30 × 40	35 × 40	35 × 50	35 × 50
	–	–	40 × 40	40 × 40
470	35 × 40	35 × 50	40 × 50	40 × 50
	–	40 × 40	–	–
680	35 × 50	40 × 50	40 × 70	40 × 70
	40 × 50	–	–	–
1000	40 × 50	40 × 70	40 × 100	40 × 100
1500	40 × 70	40 × 100	–	–
2200	40 × 100	–	–	–

Non-solid Al - electrolytic capacitors Power Long Life Printed Wiring

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MECHANICAL DATA AND PACKAGING QUANTITIES



Non-solid Al - electrolytic capacitors
Power Long Life Printed Wiring

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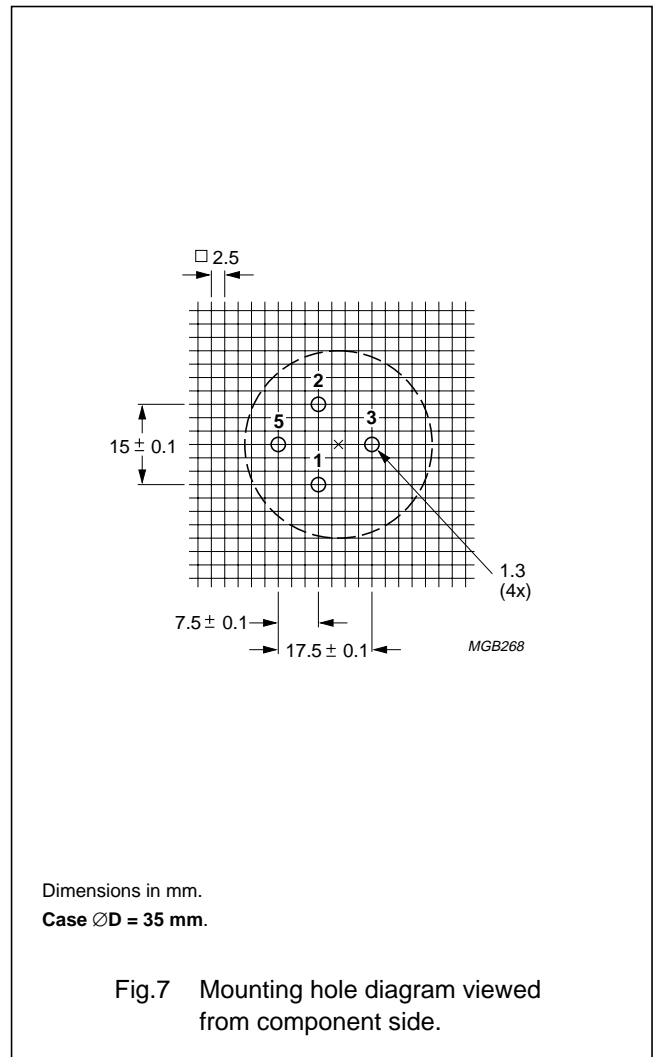
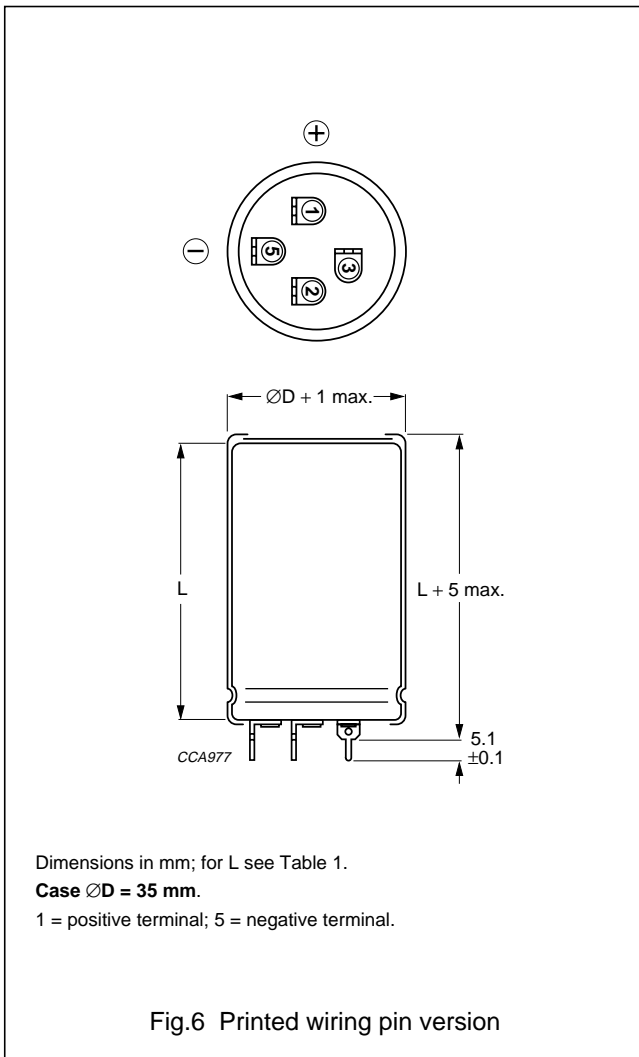
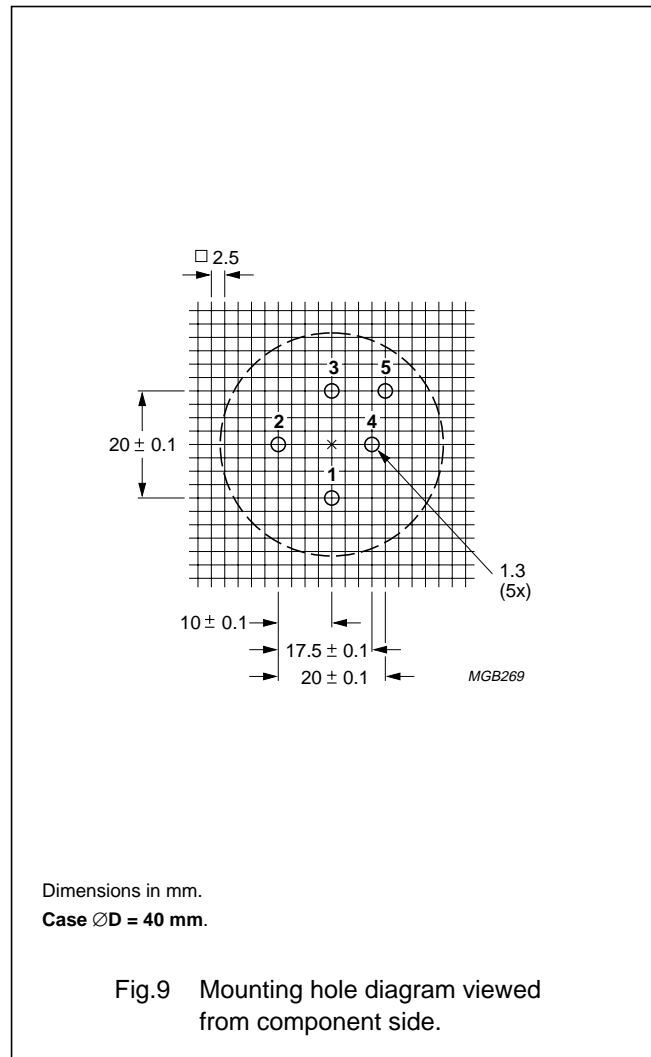
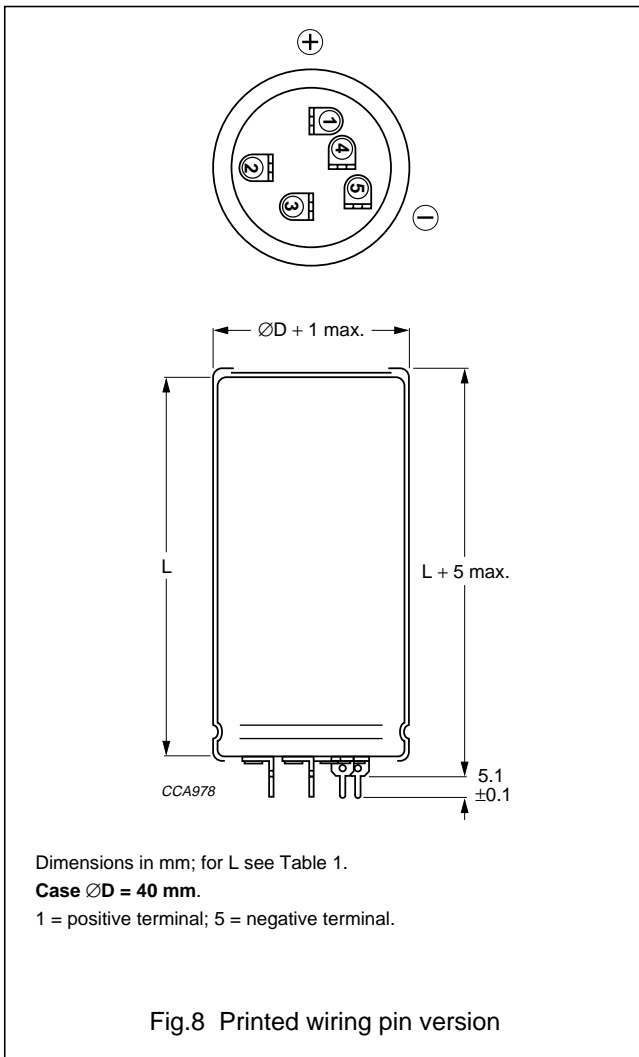


Table 1 Physical dimensions, mass and packaging information; see Figs 2, 4, 6 and 8

NOMINAL CASE SIZE $\varnothing D \times L$ (mm)	$\varnothing D_{max}$ (mm)	L_{max} (mm)	MASS (g)	PACKAGING QUANTITIES (units per box)	CARDBOARD BOX DIMENSIONS $l \times w \times h$ (mm)
25 × 30	26	35	≈24	100	290 × 280 × 45
25 × 40	26	45	≈28	100	290 × 280 × 55
30 × 40	31	45	≈38	100	340 × 330 × 55
35 × 40	36	45	≈51	50	390 × 198 × 55
35 × 50	36	45	≈66	50	390 × 198 × 65
40 × 40	41	45	≈78	50	440 × 223 × 55
40 × 50	41	55	≈82	50	440 × 223 × 65
40 × 70	41	75	≈110	50	440 × 223 × 85
40 × 100	41	105	≈176	50	440 × 223 × 115

Non-solid Al - electrolytic capacitors
Power Long Life Printed Wiring

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Mounting

When a number of capacitors are connected in a bank, they must not be closer together than 15 mm, when no derating of ripple current and/or temperature is applied.

Pin numbers 2, 3 and 4 (if present) must be free from the electrical circuit.

Non-solid Al - electrolytic capacitors Power Long Life Printed Wiring

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ELECTRICAL DATA AND ORDERING INFORMATION

Unless otherwise specified, all electrical values in Tables 2 and 3 apply at
T_{amb} = 20 °C, P = 86 to 106 kPa, RH = 45 to 75%.

SYMBOL	DESCRIPTION
C _R	rated capacitance at 100 Hz
I _R	rated RMS ripple current at 100 Hz and 105 °C
I _{L1}	max. leakage current after 1 minute at U _R
I _{L5}	max. leakage current after 5 minutes at U _R
ESR	max. equivalent series resistance at 100 Hz
Z	max. impedance at 10 kHz

Ordering example

Electrolytic capacitor
162 series
10000 µF/25 V; ±20%
Nominal case size: Ø30 × 40 mm
Catalogue number: 2222 162 56103.

Table 2 Electrical data and ordering information for **162** series; preferred types in **bold**

U _R (V)	C _R 100 Hz (µF)	NOMINAL CASE SIZE ØD × L (mm)	I _R 100 Hz 105 °C (A)	I _{L1} 1 min (mA)	I _{L5} 5 min (mA)	ESR 100 Hz (mΩ)	Z 10 kHz (mΩ)	CATALOGUE NUMBER 2222
10	10000	25 × 30	3.17	0.60	0.20	48	37	162 54103
	15000	25 × 40	4.21	0.90	0.30	34	27	162 54153
	22000	30 × 40	5.05	1.32	0.44	29	23	162 54223
	33000	35 × 40	5.63	1.98	0.66	27	22	162 54333
	47000	35 × 50	6.19	2.82	0.94	26	21	162 54473
	47000	40 × 40	6.19	2.82	0.94	26	21	162 44473
	68000	40 × 50	7.64	4.08	1.36	21	18	162 54683
	100000	40 × 70	10.0	6.00	2.00	16	15	162 54104
150000	40 × 100	12.9	9.00	3.00	13	12	162 54154	
16	6800	25 × 30	3.11	0.65	0.22	50	37	162 55682
	10000	25 × 40	4.09	0.96	0.32	36	27	162 55103
	15000	30 × 40	4.97	1.44	0.48	30	23	162 55153
	22000	35 × 40	5.53	2.12	0.71	29	22	162 55223
	33000	35 × 50	6.08	3.17	1.06	28	21	162 55333
	33000	40 × 40	6.08	3.17	1.06	28	21	162 45333
	47000	40 × 50	7.46	4.52	1.51	22	18	162 55473
	68000	40 × 70	9.70	6.53	2.18	17	15	162 55683
	100000	40 × 100	12.90	9.60	3.20	13	12	162 55104

Non-solid Al - electrolytic capacitors
Power Long Life Printed Wiring

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U_R (V)	C_R 100 Hz (μ F)	NOMINAL CASE SIZE $\varnothing D \times L$ (mm)	I_R 100 Hz 105 °C (A)	I_{L1} 1 min (mA)	I_{L5} 5 min (mA)	ESR 100 Hz (m Ω)	Z 10 kHz (m Ω)	CATALOGUE NUMBER 2222
25	4700	25 × 30	2.94	0.71	0.24	56	37	162 56472
	6800	25 × 40	3.93	1.02	0.34	39	27	162 56682
	10000	30 × 40	4.81	1.50	0.50	32	23	162 56103
	15000	35 × 40	5.43	2.25	0.75	30	22	162 56153
	22000	35 × 50	5.98	3.30	1.10	29	21	162 56223
	22000	40 × 40	5.98	3.30	1.10	29	21	162 46223
	33000	40 × 50	7.30	4.95	1.65	23	18	162 56333
	47000	40 × 70	9.43	7.05	2.35	18	15	162 56473
	68000	40 × 100	12.44	10.20	3.40	14	12	162 56683
40	2200	25 × 30	2.36	0.53	0.18	87	54	162 57222
	3300	25 × 40	3.17	0.79	0.27	60	38	162 57332
	4700	30 × 40	3.93	1.13	0.38	48	33	162 57472
	6800	35 × 40	4.59	1.63	0.55	42	31	162 57682
	10000	35 × 50	5.03	2.40	0.80	41	29	162 57103
	10000	40 × 40	5.03	2.40	0.80	41	29	162 47103
	15000	40 × 50	6.09	3.60	1.20	33	24	162 57153
	22000	40 × 70	8.34	5.28	1.76	23	18	162 57223
	33000	40 × 100	10.97	7.92	2.64	18	15	162 57333
63	1000	25 × 30	1.55	0.38	0.13	202	155	162 58102
	1500	25 × 40	2.10	0.57	0.19	137	109	162 58152
	2200	30 × 40	2.72	0.83	0.28	100	79	162 58222
	3300	35 × 40	3.44	1.25	0.42	75	61	162 58332
	4700	35 × 50	4.09	1.78	0.60	62	53	162 58472
	4700	40 × 40	4.09	1.78	0.60	62	53	162 48472
	6800	40 × 50	5.10	2.57	0.86	47	40	162 58682
	10000	40 × 70	6.86	3.78	1.26	34	29	162 58103
	15000	40 × 100	9.31	5.67	1.89	25	21	162 58153
100	470	25 × 30	1.42	0.28	0.10	240	155	162 59471
	680	25 × 40	1.90	0.41	0.14	167	109	162 59681
	1000	30 × 40	2.48	0.60	0.20	120	79	162 59102
	1500	35 × 40	3.17	0.90	0.30	88	61	162 59152
	2200	35 × 50	3.79	1.32	0.44	72	53	162 59222
	2200	40 × 40	3.79	1.32	0.44	72	53	162 49222
	3300	40 × 50	4.81	1.98	0.66	53	40	162 59332
	4700	40 × 70	6.49	2.82	0.94	38	29	162 59472
	6800	40 × 100	8.80	4.08	1.36	28	21	162 59682

Non-solid Al - electrolytic capacitors

Power Long Life Printed Wiring

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Table 3 Electrical data and ordering information for **163** series; preferred types in **bold**

U_R (V)	C_R 100 Hz (μ F)	NOMINAL CASE SIZE $\varnothing D \times L$ (mm)	I_R 100 Hz 105 °C (A)	I_{L1} 1 min (mA)	I_{L5} 5 min (mA)	ESR 100 Hz (m Ω)	Z 10 kHz (m Ω)	CATALOGUE NUMBER 2222
200	150	25 × 30	0.72	0.18	0.06	950	710	163 52151
	220	25 × 40	0.96	0.26	0.09	650	485	163 52221
	330	30 × 40	1.29	0.40	0.14	442	330	163 52331
	470	35 × 40	1.66	0.57	0.19	321	240	163 52471
	680	35 × 50	2.09	0.82	0.28	237	185	163 52681
	680	40 × 40	2.09	0.82	0.28	237	185	163 42681
	1000	40 × 50	2.71	1.20	0.40	167	133	163 52102
	1500	40 × 70	3.75	1.80	0.60	114	90	163 52152
	2200	40 × 100	5.24	2.64	0.88	79	62	163 52222
250	100	25 × 30	0.67	0.15	0.05	1060	710	163 53101
	150	25 × 40	0.92	0.22	0.08	710	485	163 53151
	220	30 × 40	1.28	0.33	0.11	492	330	163 53221
	330	35 × 40	1.65	0.49	0.17	325	240	163 53331
	470	35 × 50	2.01	0.70	0.24	256	185	163 53471
	470	40 × 40	2.01	0.70	0.24	256	185	163 43471
	680	40 × 50	2.59	1.02	0.34	182	133	163 53681
	1000	40 × 70	3.58	1.50	0.50	125	90	163 53102
	1500	40 × 100	5.05	2.25	0.75	85	62	163 53152
385	68	25 × 30	0.61	0.16	0.06	1650	1260	163 58689
	100	25 × 40	0.82	0.23	0.08	1120	855	163 58101
	150	30 × 40	1.10	0.35	0.12	755	580	163 58151
	220	35 × 40	1.44	0.51	0.17	525	405	163 58221
	330	35 × 50	1.84	0.77	0.26	360	280	163 58331
	330	40 × 40	1.84	0.77	0.26	360	280	163 48331
	470	40 × 50	2.37	1.09	0.36	260	205	163 58471
	680	40 × 70	3.24	1.58	0.53	180	140	163 58681
	1000	40 × 100	4.54	2.31	0.78	125	100	163 58102
400	68	25 × 30	0.39	0.16	0.06	3200	2660	163 56689
	100	25 × 40	0.53	0.24	0.08	2180	1810	163 56101
	150	30 × 40	0.72	0.36	0.12	1460	1210	163 56151
	220	35 × 40	0.94	0.52	0.17	1010	830	163 56221
	330	35 × 50	1.24	0.79	0.26	680	570	163 56331
	330	40 × 40	1.24	0.79	0.26	680	570	163 46331
	470	40 × 50	1.59	1.12	0.37	485	407	163 56471
	680	40 × 70	2.18	1.63	0.54	336	282	163 56681
	1000	40 × 100	3.07	2.40	0.80	230	193	163 56102

Non-solid Al - electrolytic capacitors Power Long Life Printed Wiring

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Additional electrical data

PARAMETER	CONDITIONS	VALUE
Voltage		
Surge voltage for short periods	≤200 V versions	$U_s = 1.15 \times U_R$
	≥385 V versions	$U_s = 1.1 \times U_R$
Reverse voltage		$U_{rev} \leq 1 \text{ V}$
Current		
Leakage current	after 1 minute at U_R	$I_{L1} \leq 0.006C_R \times U_R + 4 \mu\text{A}$
	after 5 minutes at U_R	$I_{L5} \leq 0.002C_R \times U_R + 4 \mu\text{A}$
Inductance		
Equivalent series inductance (ESL)	case $\varnothing D = 25 \text{ mm}$	max. 25 nH
	case $\varnothing D = 30 \text{ and } 35 \text{ mm}$	max. 30 nH
	case $\varnothing D = 40 \text{ mm}$	max. 35 nH

MARKING

The capacitors are marked (where possible) with the following information:

- Rated capacitance (in μF)
- Tolerance on rated capacitance (M for $\pm 20\%$)
- Rated voltage (in V)
- Climatic category in accordance with "IEC 68"
- Date code (year and week) in accordance with "IEC 62"
- Code for factory of origin
- Name of manufacturer
- Polarity of the terminals and '-' sign to indicate the negative terminal, visible from the top and/or side of the capacitor
- Code number
- Code for basic specification in accordance with "IEC 384-4-1" and "CECC 30301".

Non-solid Al - electrolytic capacitors
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RIPPLE CURRENT AND USEFUL LIFE

Table 4 Multiplier of ripple current (I_R) as a function of frequency

FREQUENCY (Hz)	I_R MULTIPLIER		
	$U_R = 10 \text{ to } 25 \text{ V}$	$U_R = 40 \text{ to } 100 \text{ V}$	$U_R = 200 \text{ to } 400 \text{ V}$
50	0.93	0.91	0.86
100	1.00	1.00	1.00
200	1.04	1.05	1.13
400	1.07	1.09	1.21
1000	1.11	1.13	1.29
2000	1.13	1.15	1.32
4000	1.15	1.18	1.35
≥ 10000	1.18	1.22	1.40

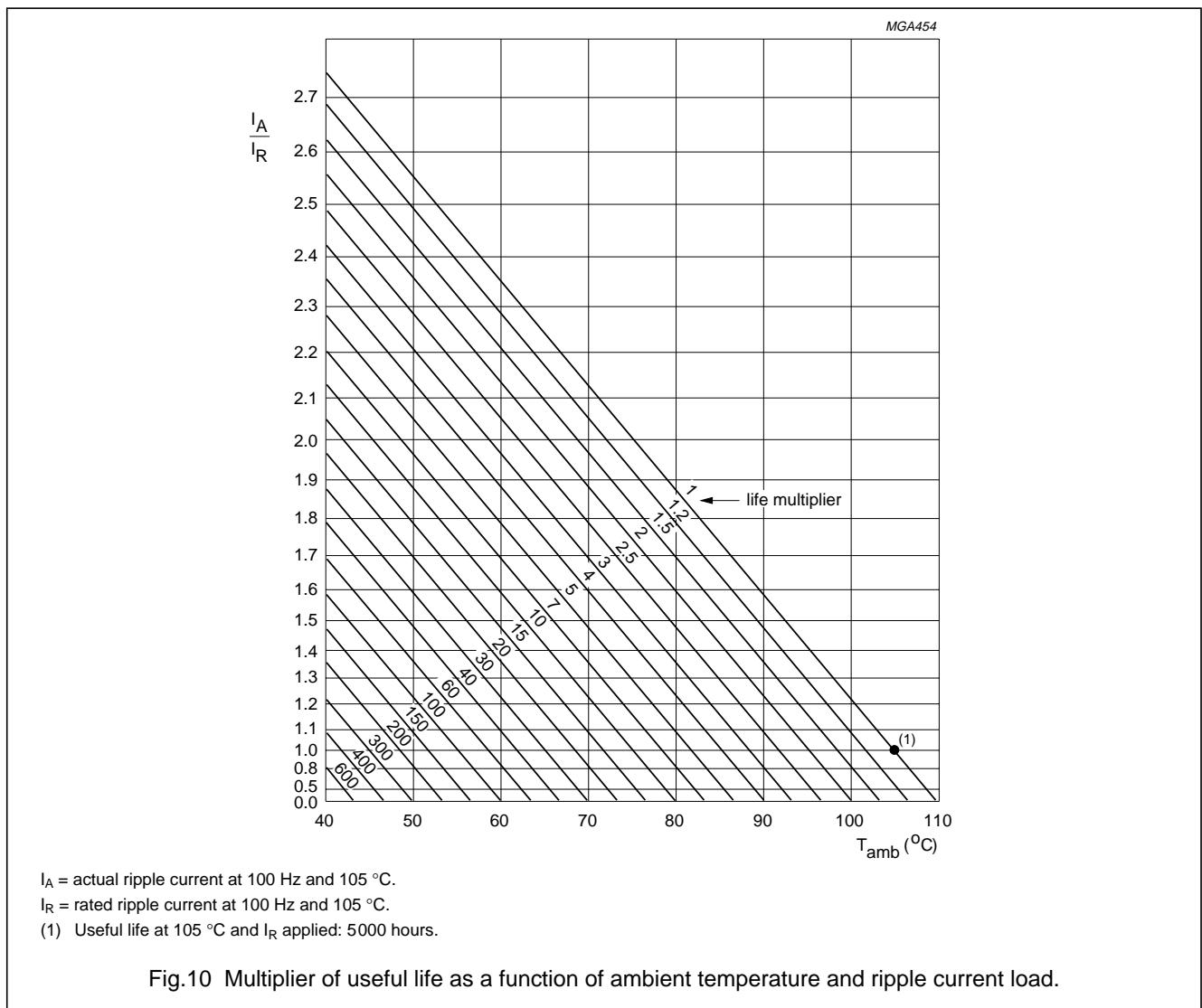


Fig.10 Multiplier of useful life as a function of ambient temperature and ripple current load.

Non-solid Al - electrolytic capacitors Power Long Life Printed Wiring

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SPECIFIC TESTS AND REQUIREMENTS

General tests and requirements are specified in data handbook PA01, Section "Tests and Requirements".

Table 5 Test procedures and requirements

TEST		PROCEDURE (quick reference)	REQUIREMENTS
NAME OF TEST	REFERENCE		
Endurance	IEC 384-4/ CECC 30300 subclause 4.13	$T_{amb} = 105\text{ °C}$; U_R applied; 2000 hours	$U_R \leq 100\text{ V}$; $\Delta C/C: \pm 15\%$ $U_R > 100\text{ V}$; $\Delta C/C: \pm 10\%$ $Z \leq 2 \times \text{spec. limit}$ $I_{L5} \leq \text{spec. limit}$
Useful life	CECC 30301 subclause 1.8.1	$T_{amb} = 105\text{ °C}$; U_R and I_R applied; 15000 hours	$U_R \leq 100\text{ V}$; $\Delta C/C: \pm 45\%$ $U_R > 100\text{ V}$; $\Delta C/C: \pm 30\%$ $Z \leq 3 \times \text{spec. limit}$ $I_{L5} \leq \text{spec. limit}$ no short or open circuit, no visible damage total failure percentage: $U_R \leq 100\text{ V}: \leq 1\%$; $U_R > 100\text{ V}: \leq 3\%$
Shelf life (storage at high temperature)	IEC 384-4/ CECC 30300 subclause 4.17	$T_{amb} = 105\text{ °C}$; no voltage applied; 500 hours; after test: U_R to be applied for 30 minutes, 24 to 48 hours before measurement	$\Delta C/C: \pm 10\%$ $I_{L5} \leq 2 \times \text{spec. limit}$