Film Capacitors

Power Electronic Capacitors

Series/Type: **MKP DC ULSI HF**
Ordering code: **B2563xE***

Date: March 2020
Version: 1

1. Construction and general data

Characteristics	
Capacitance tolerance	K: ±10%
Dielectric dissipation factor (tan δ_o)	$2 \cdot 10^{-4}$
Service life expectancy $t_{LD\ (co)}$	100 000 h at T_{hs} +70°C and V_{RDC}
Expected failure rate $\alpha_{FQ\ (co)}$	100 Fit
Storage temperature T_{stg}	-40 ... +85 °C
Minimum temperature $T_{op,min.}$	-40 °C
Maximum temperature $T_{op,max.}$	+85 °C
Maximum hotspot temperature T_{hs}	+85 °C
Climatic category	40/85/56
Maximum altitude	2000 m above sea level (derating curves available upon request)

Test data	
Voltage between terminals V_{TT}	1.5 V_{RDC}, 10 s
Dissipation factor tan δ (100 Hz)	$\leq 1.0 \cdot 10^{-3}$
Life test	According to IEC 61071
Cooling	Natural air cooling or forced air cooling
Degree of protection	IP00

Design data	
Resin filling	Hard polyurethane (Dry type), non PCB
Mounting	Lateral brackets
Max. torque terminal	Male M8: 8 Nm Female M5: 2.5 Nm

Reference standards
IEC 61071
RoHS compliance
UL 94 V0

1.1 Structure of ordering code

MKP DC LSI series

Rated voltage: 110 • 10 = 1100 V

B2563 1 E1 127 K 100

Terminal type:
1 = Male M8
2 = Female M5
9 = special

Rated capacitance:
127 = 12 · 10^7 pF = 120 µF
706 = 70 · 10^6 pF = 70 µF

Capacitance tolerance
J = ± 5%
K = ± 10%
A = special

1.2 Dimensional drawings

Figure 1: - B25631E
- Male M8 terminals

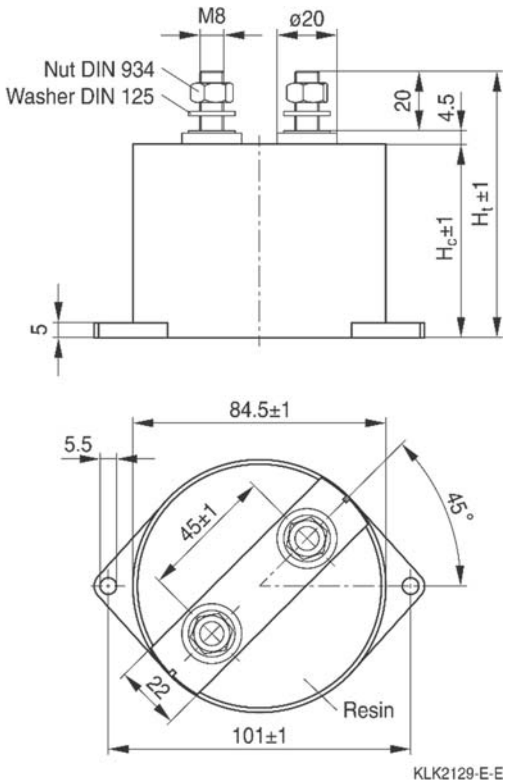
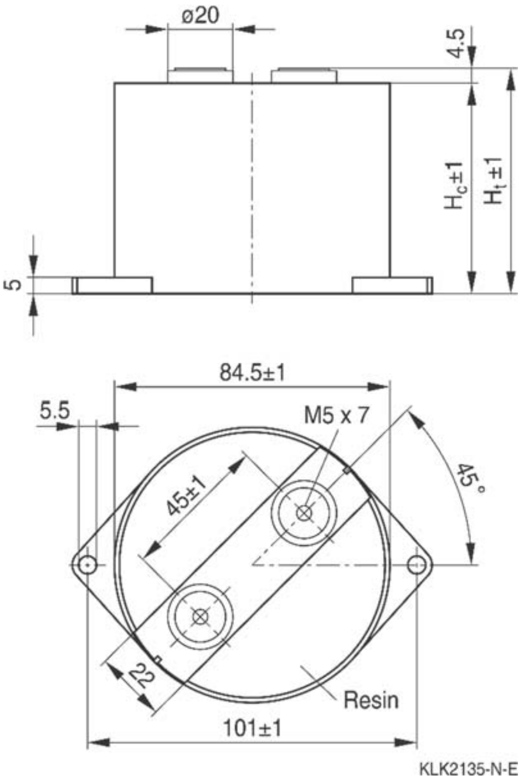


Figure 2: - B25632E
- Female M5 terminals



Terms and characteristics

The following definitions apply to power capacitors according to IEC 61071.

Rated capacitance C_R

Nominal value of the capacitance at 20 °C and measuring frequency of 100 Hz.

Rated DC voltage V_{RDC}

Maximum operating peak voltage of either polarity but of a non-reversing type wave form, for which the capacitor has been designed, for continuous operation.

Ripple voltage V_{ripple}

Peak-to-peak alternating component of the unidirectional voltage.
This value must not exceed 0.28 • V_{RDC}

Maximum surge voltage V_s

Peak voltage induced by a switching or any other disturbance of the system which is allowed for a limited number of times and short period.

Insulation voltage V_i

RMS rated value of the insulation voltage of capacitive elements and terminals to case or earth. When it is not specified in the product data sheet, the insulation voltage is at least:

$$V_i = \frac{V_{RDC}}{\sqrt{2}}$$

AC voltage test between terminals and case V_{TC}

Units having all terminals insulated from the container shall be subjected for 10 s to a voltage applied between the terminals (joined together) and the container.

Maximum rate of voltage rise $(dv/dt)_{max}$

Maximum permissible repetitive rate of voltage rise of the operational voltage.

Maximum current I_{max}

Maximum RMS current for continuous operation for the given frequency range and for the maximum ripple voltage. Please provide Frequency Spectrum of RMS current to your sales contact.

Maximum peak current $\hat{I}$

Maximum permissible repetitive current amplitude during continuous operation.
Maximum peak current ($\hat{I}$) and maximum rate of voltage rise (dV/dt)max on a capacitor are related as follows:

$$\hat{I} = C \cdot (dv/dt)_{max}$$

Maximum surge current $\hat{I}_s$

Admissible peak current induced by a switching or any other disturbance of the system which is allowed for a limited number of times and short period.

$$\hat{I}_s = C \cdot (dv/dt)_s$$

Ambient temperature T_A

Temperature of the surrounding air, measured at 10 cm distance and 2/3 of the case height of the capacitor.

Lowest operating temperature $T_{op,min}$
Lowest permitted ambient temperature at which a capacitor may be energized.

Maximum operating temperature $T_{op,max}$
Highest permitted capacitor temperature during operation, i.e. temperature at the hottest point of the case.

Hot-spot temperature T_{hs}
Temperature zone inside of the capacitor at hottest spot.

$$T_{hs} = T_A + I_{RMS}^2 * ESR * R_{th}$$

Tangent of the loss angle of a capacitor tan δ
Ratio between the equivalent series resistance and the capacitive reactance of a capacitor at a specified sinusoidal alternating voltage, frequency and temperature.

Series resistance R_s
The sum of all ohmic resistances occurring inside the capacitor.

ESR
Effective resistance which, if connected in series with an ideal capacitor of capacitance value equal to that of the capacitor in question, would have a power loss equal to active power dissipated in that capacitor under specified operating conditions.

$$ESR = \frac{\tan\delta}{\omega \cdot C} = R_s + \frac{\tan\delta_0}{\omega \cdot C}$$

Thermal resistance R_{th}
The thermal resistance indicates by how many degrees the capacitor temperature at the hot spot rises in relation to the dissipation losses.

Maximum power loss P_{max}
Maximum permissible power dissipation for the capacitor's operation.

$$P_{max} = \frac{T_{hs} - T_A}{R_{th}}$$

Self inductance L_{self}
The sum of all inductive elements which are contained in a capacitor.

Resonance frequency f_r
The lowest frequency at which the impedance of the capacitor becomes minimum.

$$f_r = \frac{1}{2\pi \cdot \sqrt{L_{self} \cdot C_R}}$$

Technical data and ordering codes

V_{RDC} V	C_R µF	I_{max}[1] A	Î kA	$Î_s$ kA	ESR[2] mΩ	L_{self} nH	f_r kHz	R_{th} K/W	Hc mm	Ht mm	Weight kg	Ordering code
600	180	55	1.4	4.2	0.9	13	104	6.8	50	54.5	0.39	B25632E0187K600
	180	55	1.4	4.2	0.9	13	104	6.8	50	74.5	0.42	B25631E0187K600
	270	60	1.4	4.2	1.2	15	79	4.5	65	69.5	0.46	B25632E0277K600
	270	60	1.4	4.2	1.2	15	79	4.5	65	89.5	0.49	B25631E0277K600
700	140	55	1.5	4.6	0.9	13	118	6.8	50	54.5	0.39	B25632E0147K700
	210	60	1.5	4.6	1.2	15	90	4.5	65	69.5	0.46	B25632E0217K700
800	110	55	2.1	6.2	1.0	13	133	6.8	50	54.5	0.39	B25632E0117K800
	110	55	2.1	6.2	1.0	13	133	6.8	50	74.5	0.42	B25631E0117K800
	160	60	2.0	5.9	1.3	15	103	4.5	65	69.5	0.46	B25632E0167K800
	160	60	2.0	5.9	1.3	15	103	4.5	65	89.5	0.49	B25631E0167K800
900	90	55	2.5	7.5	1.0	13	147	6.8	50	54.5	0.39	B25632E0906K900
	130	60	2.4	7.2	1.3	15	114	4.5	65	69.5	0.46	B25632E0137K900
1000	110	50	2.1	6.2	1.2	13	133	6.8	50	54.5	0.39	B25632E1117K000
	110	50	2.1	6.2	1.2	13	133	6.8	50	74.5	0.42	B25631E1117K000
	160	55	2.0	5.9	1.4	15	103	4.5	65	69.5	0.46	B25632E1167K000
	160	55	2.0	5.9	1.4	15	103	4.5	65	89.5	0.49	B25631E1167K000
1100	72	50	2.2	6.6	1.1	13	165	6.8	50	54.5	0.39	B25632E1726K100
	110	55	2.2	6.7	1.4	15	124	4.5	65	69.5	0.46	B25632E1117K100
1200	55	50	2.0	6.1	1.3	13	188	6.8	50	54.5	0.39	B25632E1556K200
	85	55	2.0	6.0	1.6	15	141	4.5	65	69.5	0.46	B25632E1856K200
1300	48	50	1.9	5.8	1.4	13	201	6.8	50	54.5	0.39	B25632E1486K300
	75	55	1.9	5.8	1.7	15	150	4.5	65	69.5	0.46	B25632E1756K300
1400	40	50	1.7	5.2	1.5	13	221	6.8	50	54.5	0.39	B25632E1406K400
	65	55	1.8	5.4	1.7	15	161	4.5	65	69.5	0.46	B25632E1656K400
1500	36	45	1.7	5.0	1.6	13	233	6.8	50	54.5	0.39	B25632E1366K500
	56	50	1.7	5.0	1.9	15	174	4.5	65	69.5	0.46	B25632E1566K500
1600	30	45	1.5	4.4	1.7	13	255	6.8	50	54.5	0.39	B25632E1306K600
	48	50	1.5	4.5	2.3	15	188	4.5	65	69.5	0.46	B25632E1486K600
2000	20	40	1.2	3.7	1.8	13	312	6.8	50	54.5	0.39	B25632E2206K000
	30	45	1.2	3.5	2.5	15	237	4.5	65	69.5	0.46	B25632E2306K000

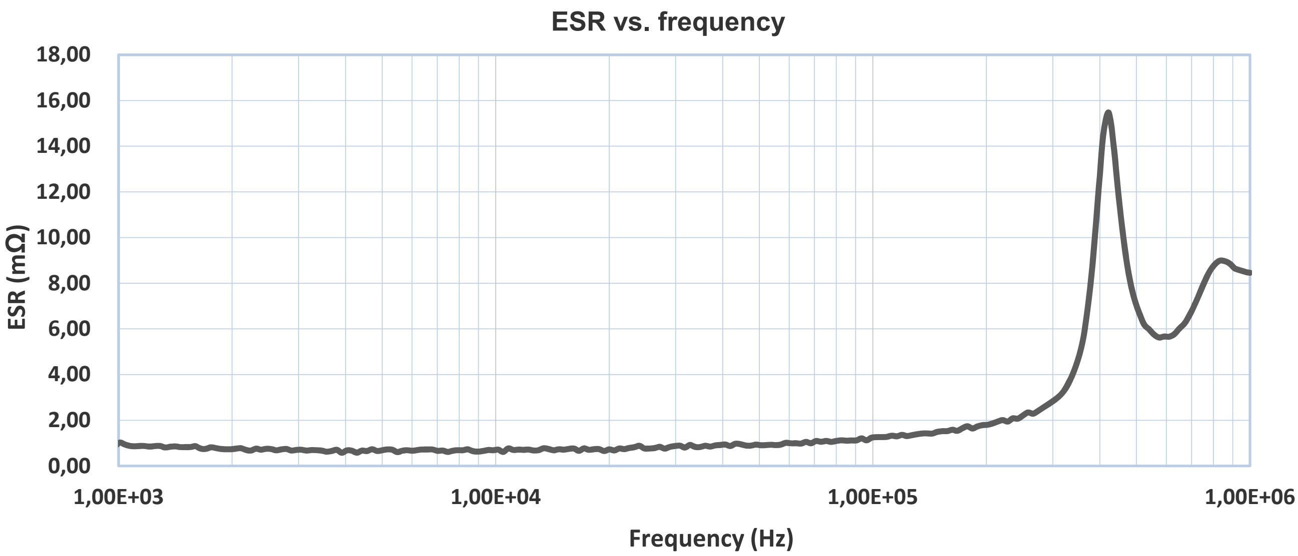
[1] Imax at ambient temperature 55 °C

[2] ESR at 10 kHz (typical value)

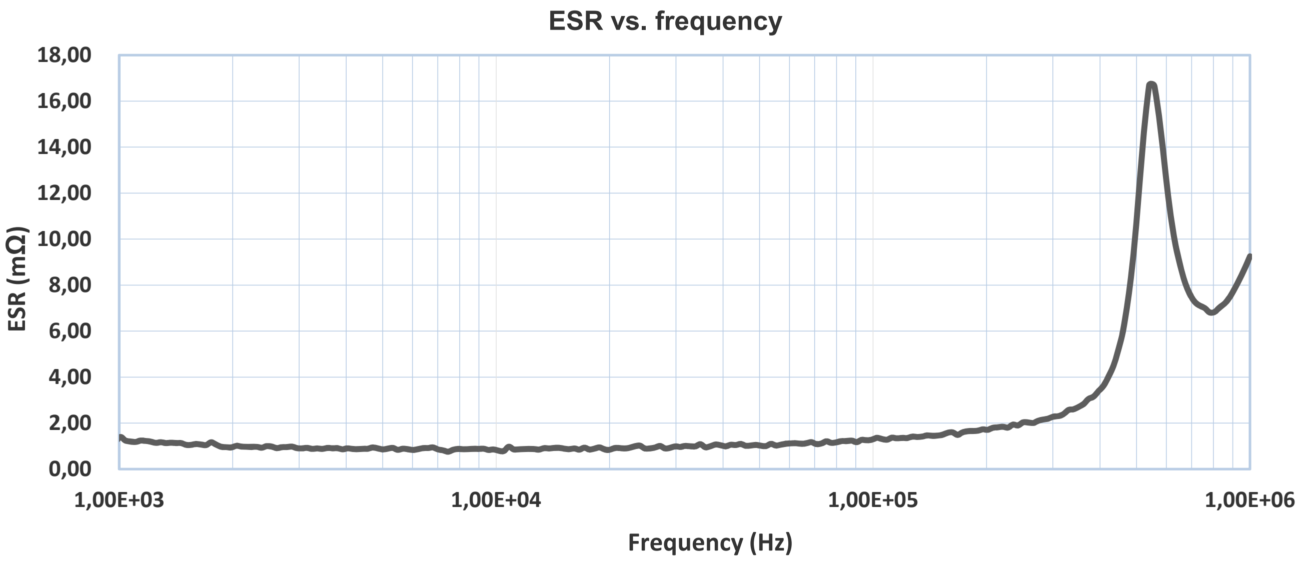
Other configurations and capacitance tolerances are available upon request

2. Typical ESR vs. frequency curves

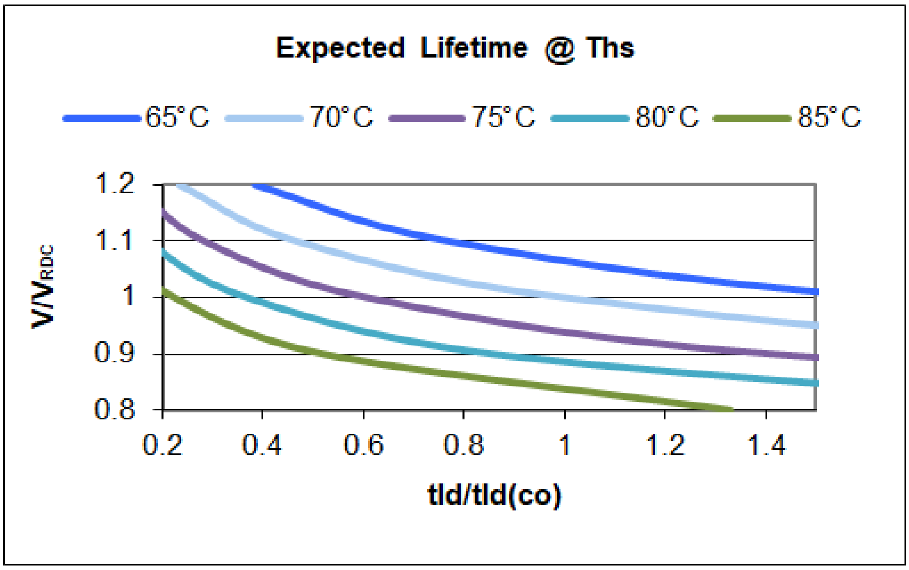
B25631E0187K600



B25632E1117K000



3. Service life expectancy



Service life t_{LD} at different hotspot temperature (Ths) and voltage V

The expected lifetime is a calculated value based on real application data and life endurance test for this capacitor series. The lifetime calculation correlates the time of test, voltage and temperature always comparing testing conditions to real application data and its own ageing factors. In order to determine the ageing factor used for this capacitor design, it was performed life endurance tests with different stress is voltage and temperature. Failure criteria is capacitance drop higher than 3%.

Cautions and warnings

- In case of dents of more than 1 mm depth or any other mechanical damage, capacitors must not be used at all.
- Check tightness of the connections/terminals periodically.
- The energy stored in capacitors may be lethal. To prevent any chance of shock, discharge and short-circuit the capacitor before handling.
- Failure to follow cautions may result, worst case, in premature failures, bursting and fire.
- Protect the capacitor properly against over current and short circuit.
- TDK Electronics is not responsible for any kind of possible damages to persons or things due to improper installation and application of capacitors for power electronics.

Safety

Electrical or mechanical misapplication of capacitors may be hazardous. Personal injury or property damage may result from bursting of the capacitor or from expulsion melted material due to mechanical disruption of the capacitor.

- Ensure good, effective grounding for capacitor enclosures.
- Observe appropriate safety precautions during operation (self-recharging phenomena and the high energy contained in capacitors).
- Handle capacitors carefully, because they may still be charged even after disconnection.
- The terminals of capacitors, connected bus bars and cables as well as other devices may also be energized.
- Follow good engineering practice.

Thermal load

After installation of the capacitor it is necessary to verify that maximum hot-spot temperature is not exceeded at extreme service conditions.

Mechanical protection

The capacitor has to be installed in a way that mechanical damages and dents in the aluminum can are avoided.

Storage and operating conditions

Do not use or store capacitors in corrosive atmosphere, especially where chloride gas, sulfide gas, acid, alkali, salt or the like are present. In dusty environments regular maintenance and cleaning especially of the terminals is required to avoid conductive path between phases and/or phases and ground.

Service life expectancy

Electrical components do not have an unlimited service life expectancy; this applies to self-healing capacitors, too. The maximum service life expectancy may vary depending on the application the capacitor is used in.

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