

Type 947C High Capacitance, High Current, DC Link Capacitors

Metallized Polypropylene Dielectric



Type 947C series uses the most advanced metallized film technology for long life, high reliability in DC link applications. Their high-voltage and high-current ratings allow for replacement of series-parallel banks of aluminum electrolytic capacitors in high ripple current applications.

Applications

Inverters: >5kW

Renewable Energy Inverters: Wind, Solar, Fuel Cell

Aircraft Inverters: Power Supplies and Motor Drives

Transportation: Electric Vehicles, Traction

Industrial: Welders, Motor Drives, Elevators, and Overhead Cranes

Specifications

Capacitance Range: 160 μ F to 730 μ F

Tolerance: \pm 10%

Rated Voltage: 800 Vdc, 1000 Vdc, 1200 Vdc

Operating Temperature Range With Ripple: -40 $^{\circ}$ C to $+85$ $^{\circ}$ C

Maximum rms Current: 60 A @ $+55$ $^{\circ}$ C

Maximum rms Voltage: <230 Vac

Test Voltage Between Terminals @ 25 $^{\circ}$ C: 150% rated DC voltage for 10 s

Test Voltage Between Terminals and Case @ 25 $^{\circ}$ C: 4 kVac @ 50/60 Hz for 1 min

Life Test: 5000 h @ $+85$ $^{\circ}$ C, rated voltage



Complies with the EU Directive 2002/95/EC requirement restricting the use of Lead (Pb), Mercury (Hg), Cadmium (Cd), Hexavalent chromium (Cr(VI)), PolyBrominated Biphenyls (PBB) and PolyBrominated Diphenyl Ethers (PBDE).

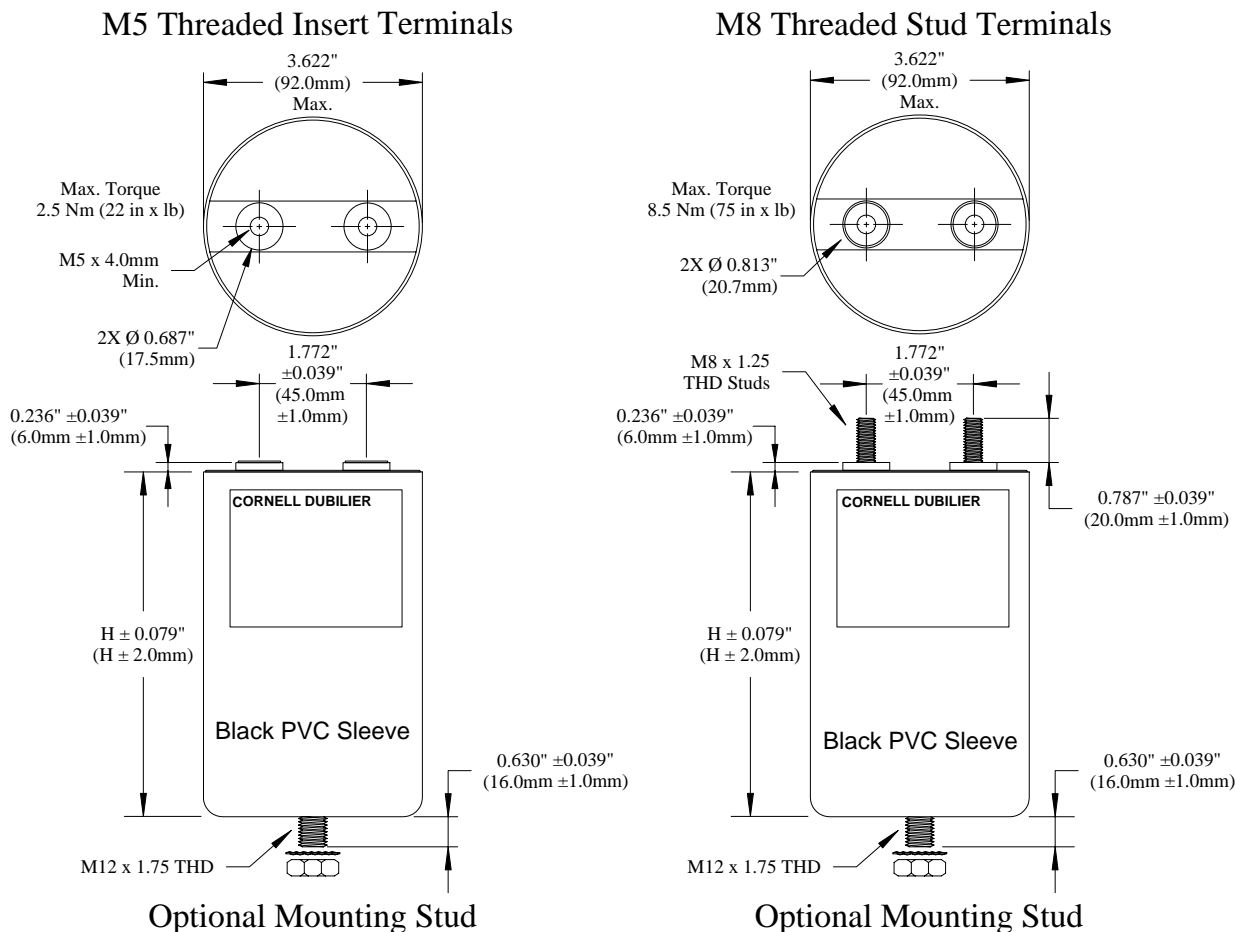
Ratings

Catalog Part Number	Rated Cap (μ F)	Rated Voltage (Vdc)	D Dia. (mm)	H Height (mm)	A Case Area (mm^2)	Rated Current $\Delta T = 40$ $^{\circ}$ C (A)	Typical ESR @ 10 kHz (m Ω)	Series Inductance (nH)	Thermal Resistance θ_{cc} ($^{\circ}$ C/W)	Thermal Resistance θ_{ca} ($^{\circ}$ C/W)	Mass (kg)
947C361K801CAMS	360	800	92	97	40100	72	1.3	60	3.0	2.9	0.9
947C491K801CBMS	490	800	92	120	46700	70	1.6	75	2.6	2.5	1.0
947C601K801CCMS	600	800	92	145	53700	68	2.0	85	2.2	2.1	1.2
947C731K801CDMS	730	800	92	170	60800	68	2.3	95	1.9	1.9	1.3
947C231K102CAMS	230	1000	92	97	40100	67	1.5	60	3.0	2.9	0.9
947C311K102CBMS	310	1000	92	120	46700	63	2.0	75	2.6	2.5	1.0
947C391K102CCMS	390	1000	92	145	53700	62	2.4	85	2.2	2.1	1.2
947C471K102CDMS	470	1000	92	170	60800	60	2.9	95	1.9	1.9	1.3
947C161K122CAMS	160	1200	92	97	40100	62	1.8	60	3.0	2.9	0.9
947C211K122CBMS	210	1200	92	120	46700	57	2.4	75	2.6	2.5	1.0
947C271K122CCMS	270	1200	92	145	53700	56	2.9	85	2.2	2.1	1.2
947C321K122CDMS	320	1200	92	170	60800	56	3.4	95	1.9	1.9	1.3

1. Rated Current is for temperature rise of $+40$ $^{\circ}$ C at 1–20 kHz.
2. θ_{cc} is core-to-case thermal resistance at 0–10 kHz. For higher frequency see **Expected Lifetime Predictions**.
3. θ_{ca} is case-to-ambient thermal resistance for still air. For moving air see **Expected Lifetime Predictions**.

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Outline Drawings

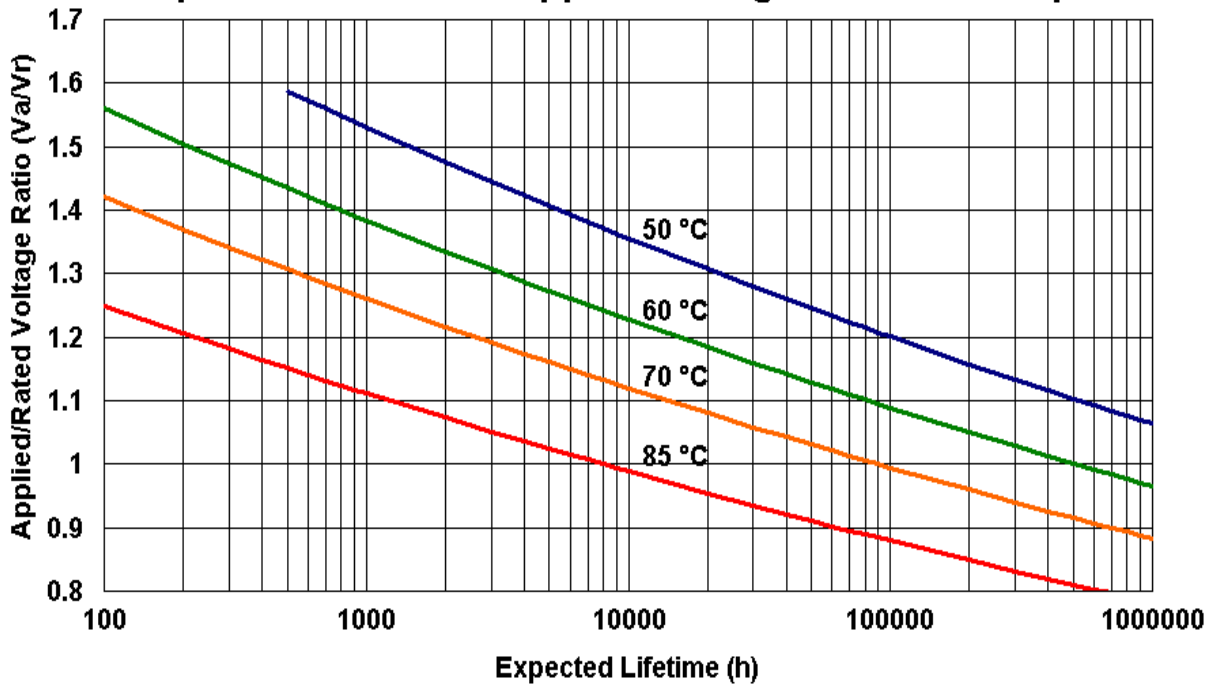


Part Numbering System

947C	361	K	801	C	A	M	S	-NS
Type	Capacitance	Tolerance	Voltage	Diameter D	Height H	Terminal	Mounting	Sleeving
947C	361 = 360 µF 731 = 730 µF	K = ±10 %	801 = 800 Vdc 102 = 1000 Vdc 122 = 1200 Vdc	C = 92 mm	A = 97 mm B = 120 mm C = 145 mm D = 170 mm	I = M5 Insert Threaded M = M8 Stud Threaded	blank = no stud S = M12 Stud Threaded	Specify -NS for Bare Can

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Expected Lifetime vs Applied Voltage and Core Temp



Expected Lifetime Predictions

To use the Expected Lifetime curves calculate V_a/V_r and core temperature T . Start by estimating:

Applied dc voltage V_a
 Ripple Current I
 Ripple Frequency f
 Ambient Temperature T_a
 Airflow speed v

Units:

$A = m^2$ $T, T_a \text{ \& } T_c = ^\circ C$
 $C = \mu F$ $\theta, \theta_{ca} \text{ \& } \theta_{cc} = ^\circ C/W$
 $ESR = m\Omega$ $v = m/s$
 $f = kHz$ $V_a \text{ \& } V_r = V_{dc}$
 $I = A$

NOTE: The temperature rise in the 947C is $I^2(ESR)$ times the thermal resistance θ . The ESR is mainly the metal resistance; the metal resistance is the 10 kHz ESR. For operation below 10 kHz add the dielectric resistance. It is the dielectric dissipation factor—no more than 0.0002—times the capacitive reactance, i.e., $0.0002/(2\pi fC)$. That's equal to $31.83/(fC)$.

1. Start with the 10 kHz ESR from the Ratings table. If frequency is less than 10 kHz, add $31.83/(fC)$.

2. Compute total thermal resistance θ as the sum of core-to-case thermal resistance θ_{cc} and case-to-ambient thermal resistance θ_{ca} . Both are in the Ratings table but θ_{ca} is for still air and θ_{cc} is for 10 kHz or less. For frequency > 10 kHz multiply θ_{cc} by $[1+(f-10)/100]$, e.g., for 75 kHz multiply θ_{cc} by 1.65. For moving air use the capacitor surface area A and airflow speed v to calculate $\theta_{ca} = 1/[A(5+17(v+0.1)^{0.66})]$.

3. Compute V_a/V_r and the core temperature T .
 $T = T_a + I^2(ESR)\theta$

4. Look up estimated lifetime from the Expected Lifetime curves.

5. If you want a longer expected lifetime, choose a capacitor with higher voltage rating or consider using multiple capacitors in parallel to share the ripple current.

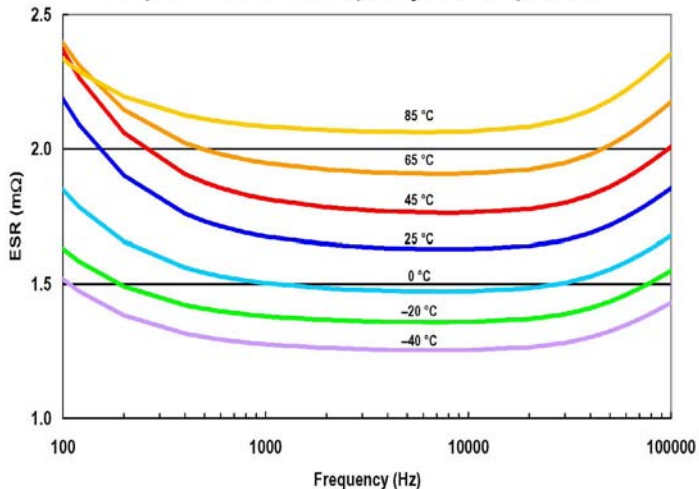
Permissible Voltage Surge Duty for 100,000 Hour
 Life Expectancy at 50 °C Core Temperature

Factor	Duration	Frequency
1.67x	≤ 100 ms	1x/day
1.50x	≤ 5 minutes	1x/day
1.30x	≤ 2.5 hours	1x/day
1.10x	≤ 9.6 hours	1x/day
1.00x	balance (11.9 h)	1x/day

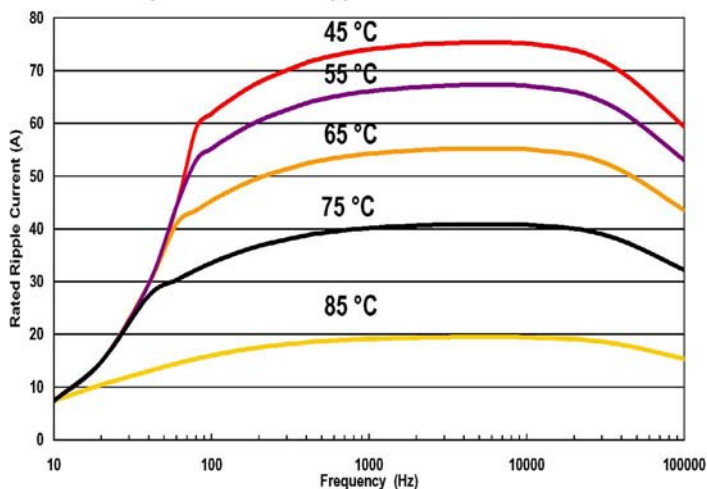
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Typical Performance Curves

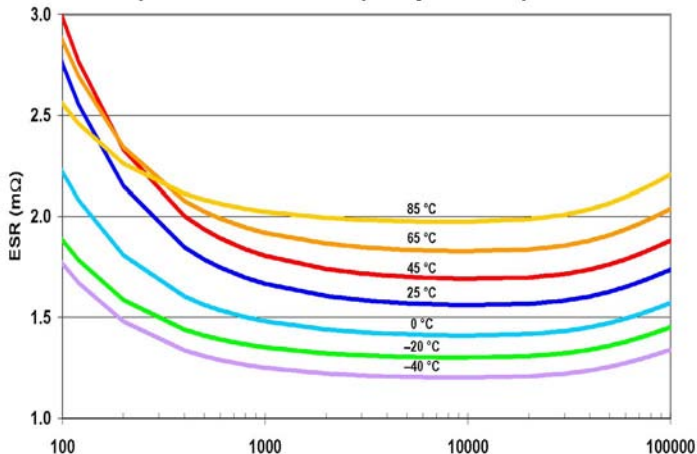
490 μF 800 V ESR vs Frequency and Temperature



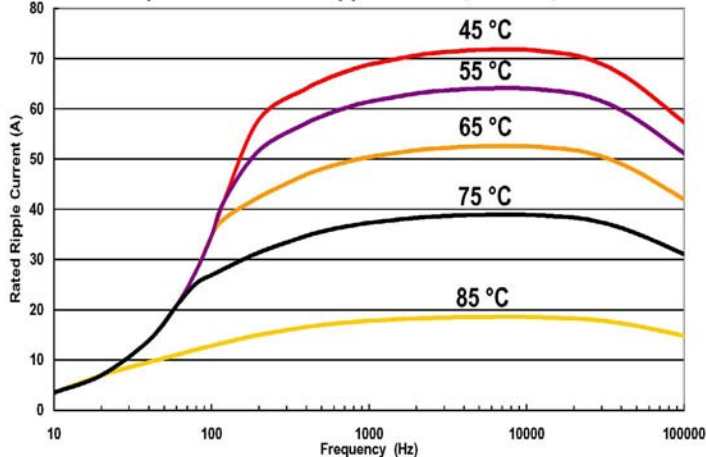
490 μF 800 V Rated Ripple Current, Still Air, 5 kh Life



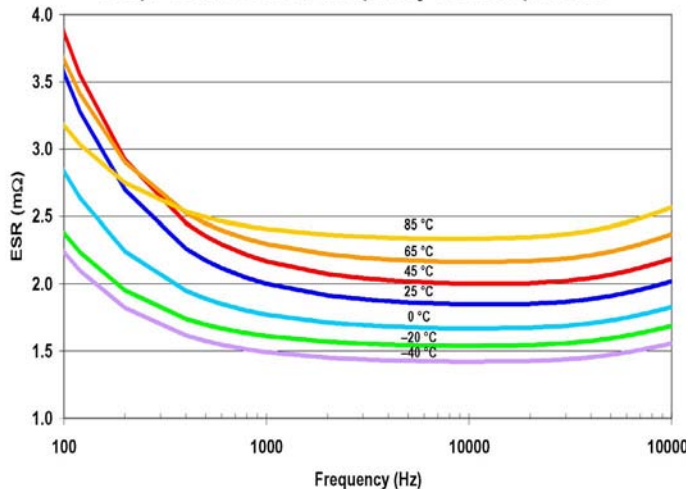
230 μF 1000 V ESR vs Frequency and Temperature



230 μF 1000 V Rated Ripple Current, Still Air, 5kh Life



160 μF 1200 V ESR vs Frequency and Temperature



160 μF 1200 V Rated Ripple Current, Still Air, 5kh Life

