# 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 µF to 730 µF |
| **Tolerance:** | ±10% |
| **Rated Voltage:** | 800 Vdc, 1000 Vdc, 1200 Vdc |
| **Operating Temperature Range With Ripple:** | –40 °C to +85 °C |
| **Maximum rms Current:** | 60 A @ +55 °C |
| **Maximum rms Voltage:** | <230 Vac |
| **Test Voltage Between Terminals @ 25 °C:** | 150% rated DC voltage for 10 s |
| **Test Voltage Between Terminals and Case @ 25 °C:** | 4 kVac @ 50/60 Hz for 1 min |
| **Life Test:** | 5000 h @ +85 °C, rated voltage |

RoHS Compliant

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

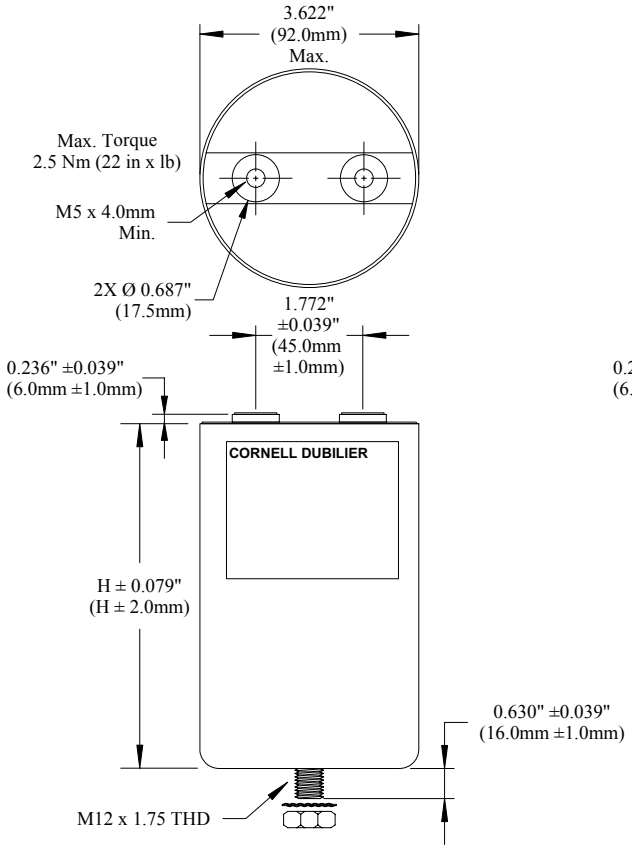
| Catalog Part Number | Cap (µF) | Rated Voltage (Vdc) | D Dia. (mm) | H Height (mm) | A Case Area (mm²) | Rated Current ΔT = 40 °C (A) | Typical ESR @ 10 kHz (mΩ) | Series Inductance (nH) | Thermal Resistance θcc (°C/W) | Thermal Resistance θca (°C/W) | Mass (kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 °C at 1–20 kHz.
2. θcc is core-to-case thermal resistance at 0–10 kHz. For higher frequency see **Expected Lifetime Predictions**.
3. θca is case-to-ambient thermal resistance for still air. For moving air see **Expected Lifetime Predictions**.

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

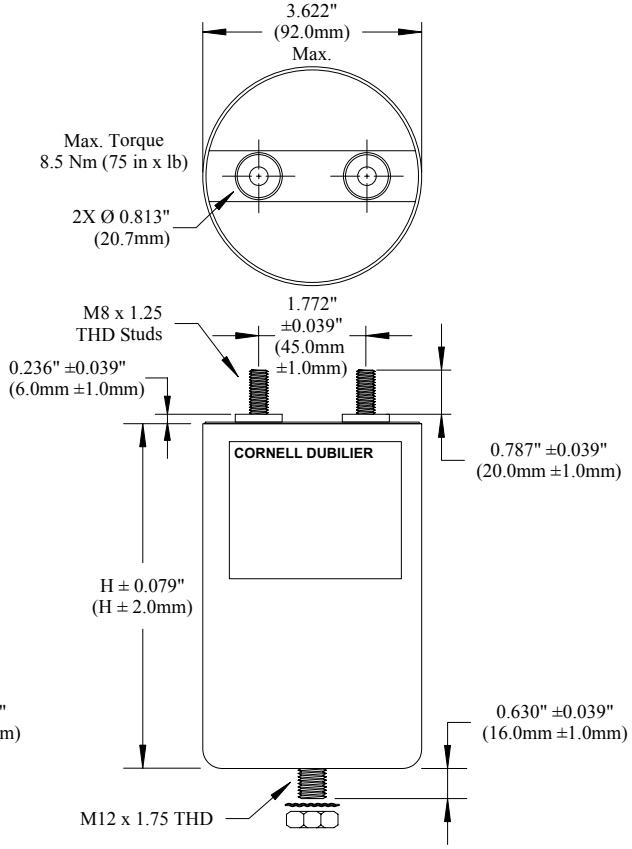
## Outline Drawings

M5 Threaded Insert Terminals




Optional Mounting Stud

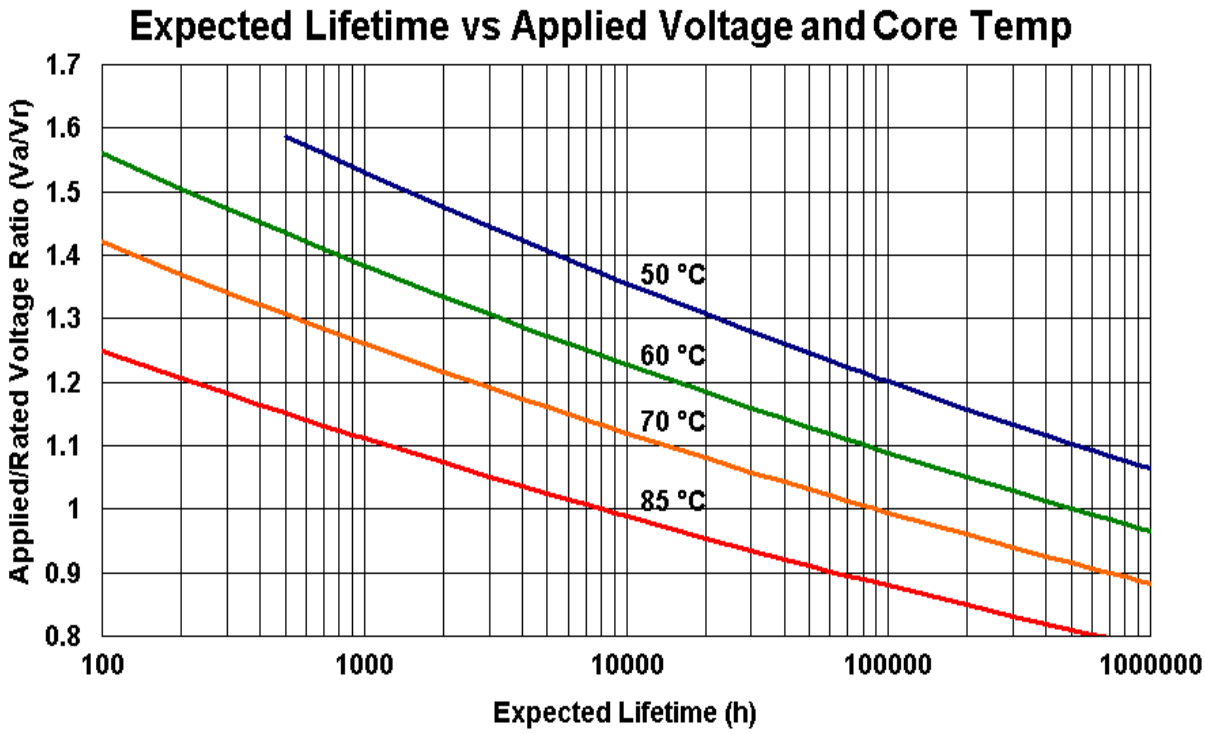
M8 Threaded Stud Terminals




Optional Mounting Stud

## Part Numbering System

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




## Expected Lifetime Predictions

To use the Expected Lifetime curves calculate Va⁄Vr and core temperature T. Start by estimating:

Applied dc voltage Va
Ripple Current I
Ripple Frequency f
Ambient Temperature Ta
Airflow speed v

Units:

| | |
|---|---|
| A=m² | T, Ta & Tc=°C |
| C=µF | θ, θca & θcc =°C/W |
| ESR=mΩ | v=m/s |
| f=kHz | Va &Vr=Vdc |
| I=A | |

**NOTE:** The temperature rise in the 947C is I²(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⁄(2πfC). 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 θcc and case-to-ambient thermal resistance θca. Both are in the Ratings table but θca is for still air and θcc is for 10 kHz or less. For frequency > 10 kHz multiply θcc by [1+(f –10)/100], e.g., for 75 kHz multiply θcc 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 Va⁄Vr and the core temperature T.
$T = Ta + I^2(ESR)\theta$

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

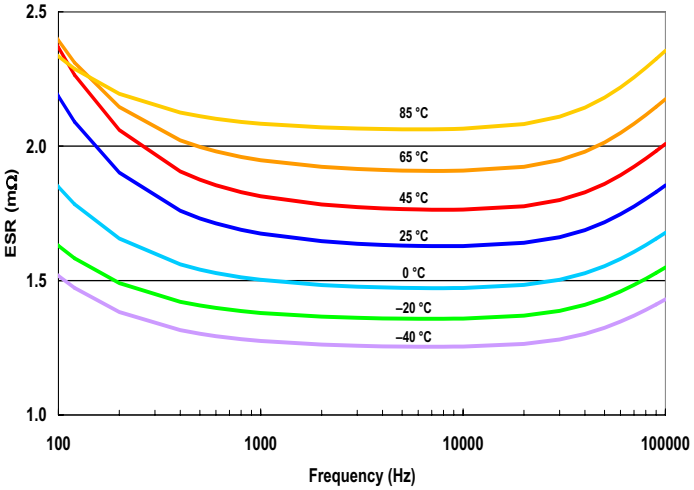
5. If you want a longer expected lifetime, choose a capacitor with higher voltage rating or consider using multiple capacitors in parallel to share the ripple current.

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

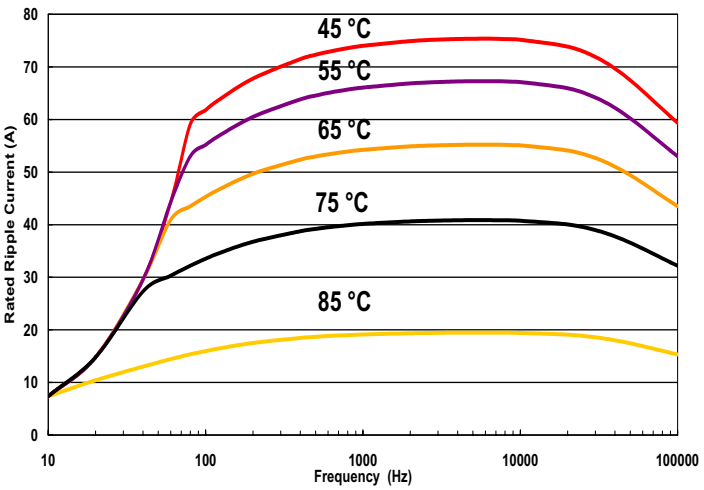
| Factor | Duration | Frequency |
|---|---|---|
| 1.67x | t≤ 100 ms | 1x/day |
| 1.50x | t≤ 5 minutes | 1x/day |
| 1.30x | t≤ 2.5 hours | 1x/day |
| 1.10x | t≤ 9.6 hours | 1x/day |
| 1.00x | balance (11.9 h) | 1x/day |

## Typical Performance Curves

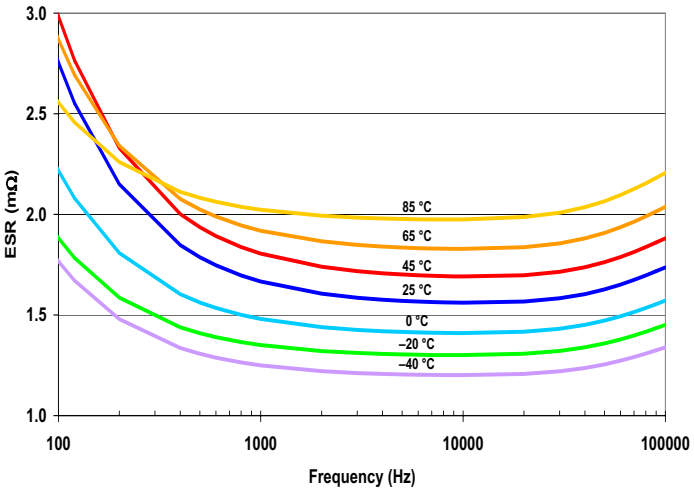
490 µF 800 V ESR vs Frequency and Temperature



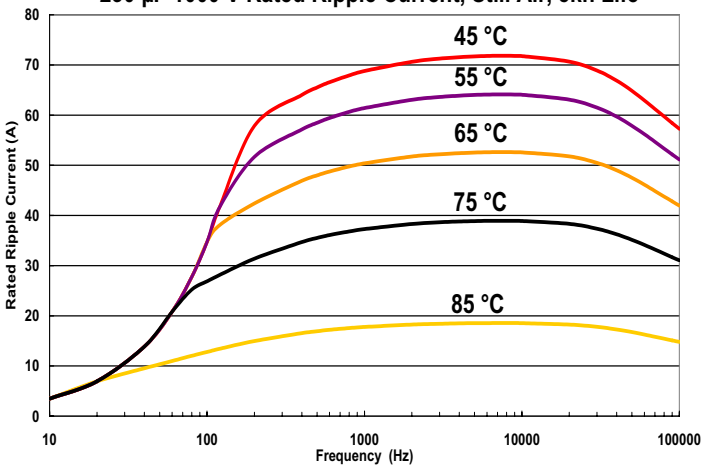

490 µF 800 V Rated Ripple Current, Still Air, 5 kh Life



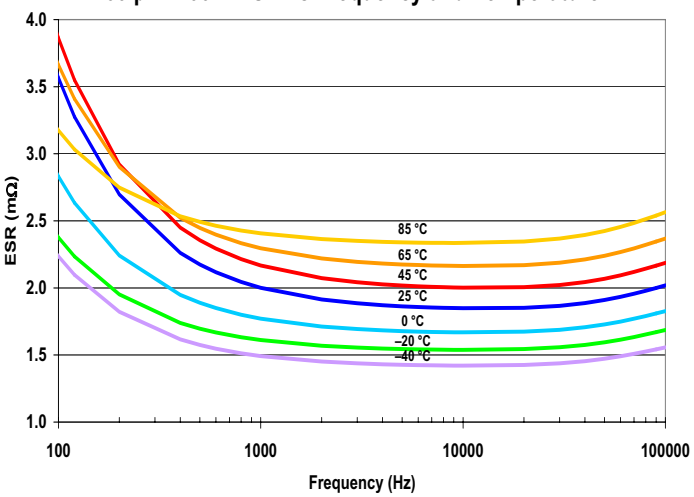

230 µF 1000 V ESR vs Frequency and Temperature




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

