

# Type 944U Polypropylene, DC Link Capacitors

## High Current, Low Profile for Inverter Applications



Type 944U is specifically designed for use in high power DC filtering applications. The low inductance internal construction utilizes low loss metallized polypropylene for high ripple current capability. Male or female terminal options offer design flexibility in a rugged UL 94V0 rated flame retardant plastic case and resin fill. High current ratings and robust mounting flanges make the 944U suited for inverter applications in electric vehicle power inverters, wind power inverters and motor drives.

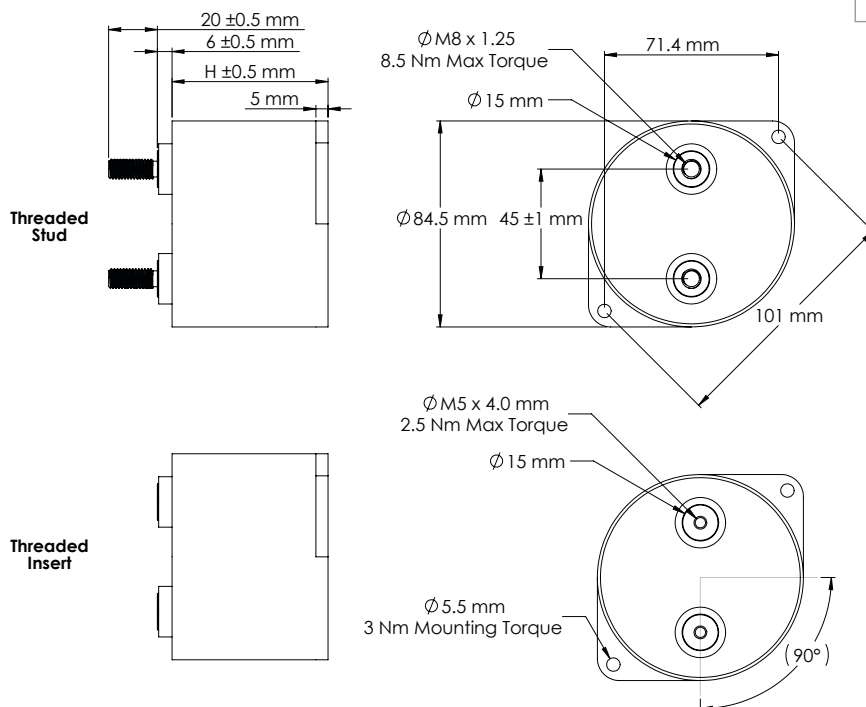
### Highlights

- Low Inductance
- Low Profile
- Low ESR
- High Ripple Current
- High Voltage Ratings

### Specifications

|                                              |                                |
|----------------------------------------------|--------------------------------|
| Capacitance Range                            | 33 to 220 $\mu$ F              |
| Capacitance Tolerance                        | $\pm$ 10% standard             |
| Rated Voltage                                | 800 to 1400 Vdc                |
| Operating Temperature Range with Ripple      | -40 °C to 85 °C                |
| Maximum rms Current                          | 74A @ 55 °C                    |
| Maximum rms Voltage                          | 230 Vac                        |
| Test Voltage between Terminal @ 25°C         | 150% rated DC voltage for 10 s |
| Test Voltage between Terminals & Case @ 25°C | 4 kVac @ 50/60 Hz for 60 s     |
| Life Test                                    | 5000 h @ 85 °C, rated voltage  |
| RoHS Compliant                               |                                |

### Dimensions



| Construction Details |                   |
|----------------------|-------------------|
| Case Material        | Plastic UL94V-0   |
| Resin Material       | Dry Resin UL94V-0 |
| Terminal Material    | Tin Plated Brass  |

# Type 944U Polypropylene, DC Link Capacitors

## High Current, Low Profile for Inverter Applications

### Part Numbering System

| 944U | 101                                                       | K             | 801                                                                 | A               | A                          | M                                    |
|------|-----------------------------------------------------------|---------------|---------------------------------------------------------------------|-----------------|----------------------------|--------------------------------------|
| Type | Capacitance                                               | Tolerance     | Voltage                                                             | Diameter D (mm) | Height H (mm)              | Terminal                             |
| 944U | 101 = 100 $\mu$ F<br>700 = 70 $\mu$ F<br>470 = 47 $\mu$ F | K = $\pm$ 10% | 801 = 800 Vdc<br>102 = 1000 Vdc<br>122 = 1200 Vdc<br>142 = 1400 Vdc | A = 84.5        | A = 40<br>B = 51<br>C = 64 | M = M8 Thd Stud<br>I = M5 Thd Insert |

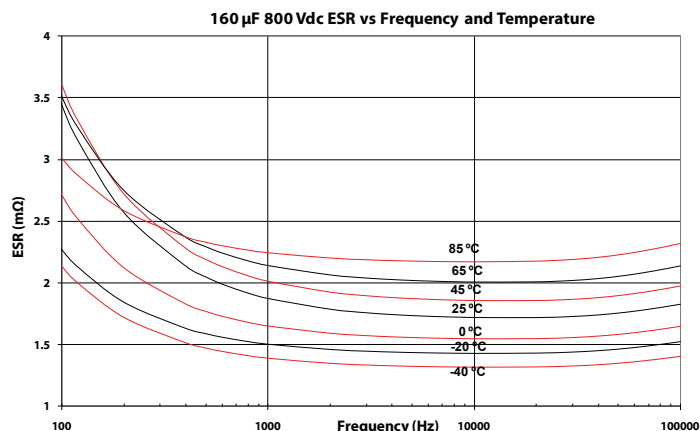
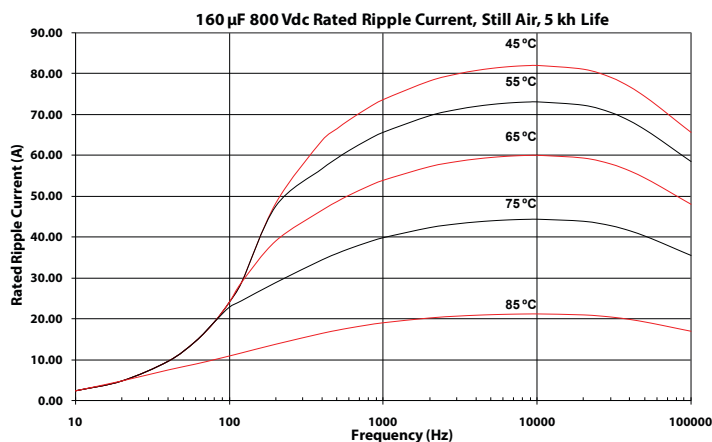
### Ratings

**NOTE:** Other ratings, sizes and performance specifications are available. Contact us.

| Catalog Part Number | Cap ( $\mu$ F) | Rated Voltage (Vdc) | H Height mm | Typical ESR 10kHz (m $\Omega$ ) | Typical ESL (nH) | Max Irms 55°C (A) | Thermal Resistance $\Theta_{cc}$ (°C/W) | $\Theta_{ca}$ (°C/W) |
|---------------------|----------------|---------------------|-------------|---------------------------------|------------------|-------------------|-----------------------------------------|----------------------|
| 944U101K801AA*      | 100            | 800                 | 40          | 0.5                             | 20               | 74                | 2.8                                     | 5.2                  |
| 944U161K801AB*      | 160            | 800                 | 51          | 0.8                             | 30               | 73                | 3.0                                     | 4.5                  |
| 944U221K801AC*      | 220            | 800                 | 64          | 1.0                             | 40               | 72                | 3.1                                     | 4.0                  |
| 944U660K102AA*      | 66             | 1000                | 40          | 0.6                             | 20               | 70                | 2.8                                     | 5.2                  |
| 944U101K102AB*      | 100            | 1000                | 51          | 0.8                             | 30               | 68                | 3.0                                     | 4.5                  |
| 944U141K102AC*      | 140            | 1000                | 64          | 1.0                             | 40               | 65                | 3.1                                     | 4.0                  |
| 944U470K122AA*      | 47             | 1200                | 40          | 0.7                             | 20               | 67                | 2.8                                     | 5.2                  |
| 944U700K122AB*      | 70             | 1200                | 51          | 1.0                             | 30               | 65                | 3.0                                     | 4.5                  |
| 944U101K122AC*      | 100            | 1200                | 64          | 1.3                             | 40               | 64                | 3.1                                     | 4.0                  |
| 944U330K142AA*      | 33             | 1400                | 40          | 0.8                             | 20               | 64                | 2.8                                     | 5.2                  |
| 944U520K142AB*      | 52             | 1400                | 51          | 1.1                             | 30               | 60                | 3.0                                     | 4.5                  |
| 944U700K142AC*      | 70             | 1400                | 64          | 1.4                             | 40               | 59                | 3.1                                     | 4.0                  |

\* M = M8 Stud I = M5 Insert

### Typical Performance Curves



# Type 944U Polypropylene, DC Link Capacitors

## High Current, Low Profile for Inverter Applications

### 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 944U is  $I^2(ESR)$  times the thermal resistance  $\theta$ . The ESR is mainly the metal resistance; the metal resistance is the 10 kHz ESR. The dielectric resistance needs to be considered for operation below 10kHz.

1. Start with the 10kHz ESR from the ratings table. If frequency is less than 10kHz, use the following equation:  $ESR = 31.83/(10C) + 31.83/(fC)$ .

2. Compute total thermal resistance  $\theta$  as the sum of core-to-case thermal resistance  $\theta_{cc}$  and case-to-ambient thermal resistance  $\theta_{ca}$ . Both are in the ratings table but  $\theta_{ca}$  is for still air. For moving air use the capacitor surface area  $A$  and airflow speed  $v$  to calculate  $\theta_{ca} = 1/[A(5+17.5(v+0.1)^{0.66})]$ .

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.

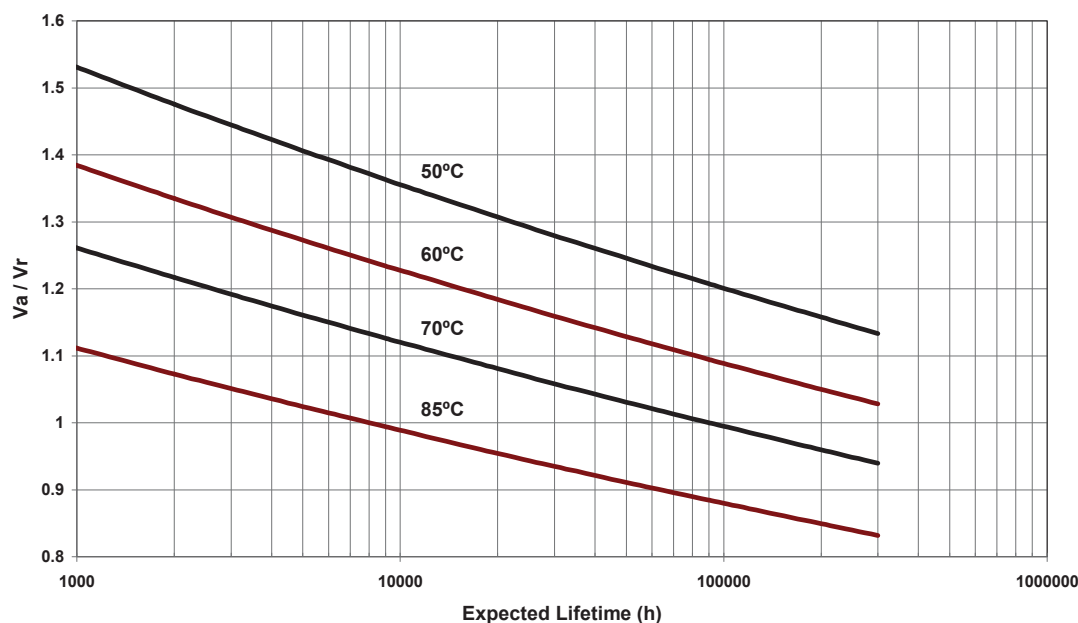
5. If you want a longer expected lifetime, choose a capacitor with higher voltage rating or consider using multiple capacitors in parallel to share the ripple current.

The expected lifetime predictions assume no exposure to overvoltage transients. Expected lifetime can be calculated for varying exposure to overvoltage transients. As an illustration at 50 °C the expected lifetime is 100,000 h with the 24-hour  $V_a/V_r$  profile below:

| $V_a / V_r$ | Duration   |
|-------------|------------|
| 1.67        | 100 ms     |
| 1.50        | 5 minutes  |
| 1.30        | 2.5 hours  |
| 1.10        | 9.6 hours  |
| 1.00        | 11.9 hours |

For applications with more severe 24-hour profiles, contact us.

### Expected Lifetime vs Hot Spot Temperature and Applied DC Voltage



**Notice and Disclaimer:** All product drawings, descriptions, specifications, statements, information and data (collectively, the "Information") in this datasheet or other publication are subject to change. The customer is responsible for checking, confirming and verifying the extent to which the Information contained in this datasheet or other publication is applicable to an order at the time the order is placed. All Information given herein is believed to be accurate and reliable, but it is presented without any guarantee, warranty, representation or responsibility of any kind, expressed or implied. Statements of suitability for certain applications are based on the knowledge that the Cornell Dubilier company providing such statements ("Cornell Dubilier") has of operating conditions that such Cornell Dubilier company regards as typical for such applications, but are not intended to constitute any guarantee, warranty or representation regarding any such matter – and Cornell Dubilier specifically and expressly disclaims any guarantee, warranty or representation concerning the suitability for a specific customer application, use, storage, transportation, or operating environment. The Information is intended for use only by customers who have the requisite experience and capability to determine the correct products for their application. Any technical advice inferred from this Information or otherwise provided by Cornell Dubilier with reference to the use of any Cornell Dubilier products is given gratis (unless otherwise specified by Cornell Dubilier), and Cornell Dubilier assumes no obligation or liability for the advice given or results obtained. Although Cornell Dubilier strives to apply the most stringent quality and safety standards regarding the design and manufacturing of its products, in light of the current state of the art, isolated component failures may still occur. Accordingly, customer applications which require a high degree of reliability or safety should employ suitable designs or other safeguards (such as installation of protective circuitry or redundancies or other appropriate protective measures) in order to ensure that the failure of an electrical component does not result in a risk of personal injury or property damage. Although all product-related warnings, cautions and notes must be observed, the customer should not assume that all safety measures are indicated in such warnings, cautions and notes, or that other safety measures may not be required.