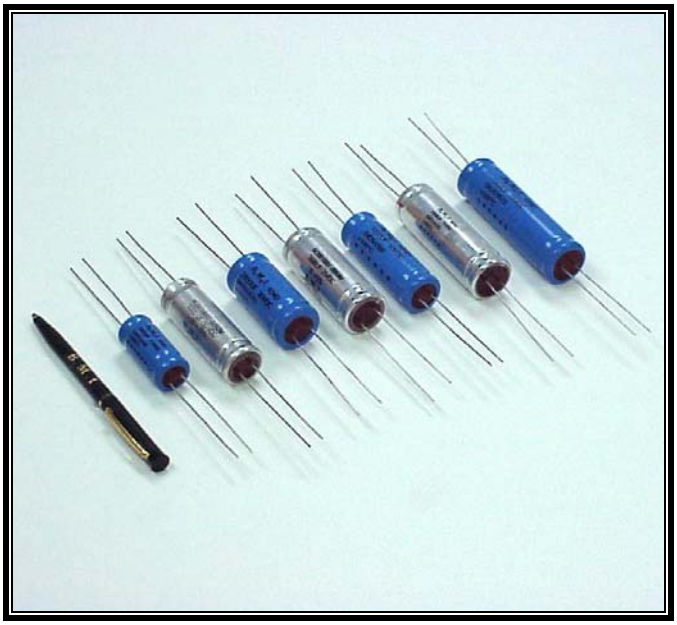
# +105°C 4-Terminal Tubular Axial Lead Aluminum Capacitors



## Features-

- **4-Terminal Construction**
- **Inductance Limit 2nH**
- **Wide Temperature Range**
- **Mil Version to Mil-PRF-39018/07**
- **Feed Thru Construction**

## *General Specifications-*

**Operating Temperature:**
-55 to +105°C

**Voltage Range:**
5 – 200 VDC

**Capacitance Range:**
47µF to 22,000µF

**Capacitance Tolerance:**
-10%/+50% (Std.)

**Case Size Range:**
0.750" X 1.625" – 1.000" X 3.625"

**Termination:**
4 – Terminal, Axial Leads.

**Life Validation Test: 2,000hrs @ +105°C**
Δ CAP ± 15% From initial measurement.
Δ ESR ≤ 1.50X Initial specified limit.
Δ DCL ≤ Initial specified limit.

**Shelf Test: 500hrs @ +105°C**
Δ CAP ≤ 10% From initial measurement.
Δ ESR ≤ 1.20X Initial specified limit.
Δ DCL ≤ 2.0X Initial specified limit.

**DC Leakage Current: (After 5 min. charge)**

$\mathbf{I = k\sqrt{CV}}$ ;
k = 0.5 @ +25°C; k = 3.0 @ +105°C
Where:
I is in µA
C is in µF
V is in Volts

**Ripple Current Multipliers:**

Temperature:

| Ambient Temp. | Multiplier |
|---|---|
| +105°C | 0.45 |
| +85°C | 1.00 |
| +75°C | 1.18 |
| +65°C | 1.34 |
| +25°C | 1.84 |

**Low Temperature Performance:**
Capacitance Ratio $C^{-55°C}/C^{+25°C}$ min. @ 120Hz**.**

| Rated Voltage (VDC) | Capacitance Remaining |
|---|---|
| 5 – 50 | 75% |
| 51 & Up | 80% |

ESR Ratio $ESR^{-55°C}/ESR^{+25°C}$ max. @ 120Hz

| Rated Voltage (VDC) | Multiplier |
|---|---|
| 5 – 50 | 12 |
| 51 & Up | 18 |

## PART NUMBER BREAK-DOWN:

**604D 272 F 005 GJ 2**

**CASE STYLE:**
1 = P.V.C. SLEEVE
2 = POLYESTER SLEEEVE (STD.)
5 = POLYESTER SLEEVE w/ EPOXY END SEAL
(REQ'D FOR EXPOSURE TO HALOGENATED CLEANING SOLVENTS.)
7 = P.V.C. SLEEVE w/ EPOXY END SEAL
(REQ'D FOR EXPOSURE TO HALOGENATED CLEANING SOLVENTS.)

**CASE CODE:**
(SEE TABLE 1.)

**DC VOLTAGE RATING:**
EXPRESSED IN VOLTS. THE LETTER "R" SIGNIFIES A DECIMAL POINT. (ie. 7R5 = 7.5 VOLTS.)

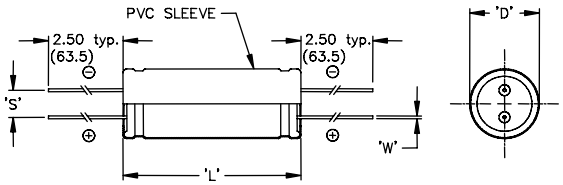
**CAPACITANCE TOLERANCE:**
F = -10%/+50% (STD.)

**CAPACITANCE:**
EXPRESSED IN MICROFARADS. THE FIRST TWO DIGITS ARE SIGNIFICANT FIGURES, THE THIRD IS THE NUMBER OF ZEROS.

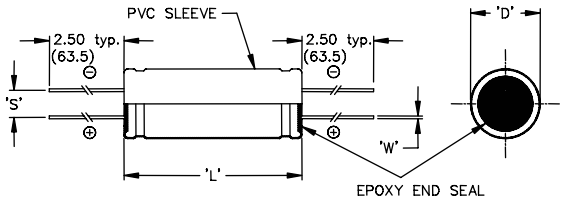
**BMI TYPE #:**
IDENTIFIES THE BASIC CAPACITOR DESIGN.

## Axial 4-Leaded Capacitor Dimensions

### STYLES 1 & 2




### STYLES 5 & 7




## Table 1. Case Dimensions mm(in.)

| CASE CODE | NOMINAL | | PVC SLEEVING | | OUTER INSULATION WITH EPOXY COATED | | LEAD SPACING | WIRE GAUGE 'W' |
|---|---|---|---|---|---|---|---|---|
| | 'D' | 'L' | 'D' ±0.79(±0.031) | 'L' max. | 'D' ±0.79(±0.031) | 'L' max. | S ±0.38 (±0.015) | |
| GJ | 19.05 (0.750) | 41.3 (1.625) | 20.6 (0.812) | 44.7 (1.761) | 20.6 (0.812) | 46.8 (1.843) | 6.35 (0.250) | No. 18 AWG (0.040") |
| GL | 19.05 (0.750) | 54.0 (2.125) | 20.6 (0.812) | 57.4 (2.261) | 20.6 (0.812) | 59.5 (2.343) | 6.35 (0.250) | No. 18 AWG (0.040") |
| GP | 19.05 (0.750) | 66.7 (2.625) | 20.6 (0.812) | 70.1 (2.761) | 20.6 (0.812) | 72.2 (2.843) | 6.35 (0.250) | No. 18 AWG (0.040") |
| GS | 19.05 (0.750) | 79.4 (3.125) | 20.6 (0.812) | 82.8 (3.261) | 20.6 (0.812) | 84.9 (3.343) | 6.35 (0.250) | No. 18 AWG (0.040") |
| GT | 19.05 (0.750) | 92.1 (3.625) | 20.6 (0.812) | 95.5 (3.761) | 20.6 (0.812) | 97.6 (3.843) | 6.35 (0.250) | No. 18 AWG (0.040") |
| HJ | 22.23 (0.875) | 41.3 (1.625) | 23.8 (0.937) | 44.7 (1.761) | 23.8 (0.937) | 46.8 (1.843) | 7.62 (0.300) | No. 18 AWG (0.040") |
| HL | 22.23 (0.875) | 54.0 (2.125) | 23.8 (0.937) | 57.4 (2.261) | 23.8 (0.937) | 59.5 (2.343) | 7.62 (0.300) | No. 18 AWG (0.040") |
| HP | 22.23 (0.875) | 66.7 (2.625) | 23.8 (0.937) | 70.1 (2.761) | 23.8 (0.937) | 72.2 (2.843) | 7.62 (0.300) | No. 18 AWG (0.040") |
| HS | 22.23 (0.875) | 79.4 (3.125) | 23.8 (0.937) | 82.8 (3.261) | 23.8 (0.937) | 84.9 (3.343) | 7.62 (0.300) | No. 18 AWG (0.040") |
| HT | 22.23 (0.875) | 92.1 (3.625) | 23.8 (0.937) | 95.5 (3.761) | 23.8 (0.937) | 97.6 (3.843) | 7.62 (0.300) | No. 18 AWG (0.040") |
| JJ | 25.40 (1.000) | 41.3 (1.625) | 27.0 (1.062) | 44.7 (1.761) | 27.0 (1.062) | 46.8 (1.843) | 10.16 (0.400) | No. 18 AWG (0.040") |
| JL | 25.40 (1.000) | 54.0 (2.125) | 27.0 (1.062) | 57.4 (2.261) | 27.0 (1.062) | 59.5 (2.343) | 10.16 (0.400) | No. 18 AWG (0.040") |
| JP | 25.40 (1.000) | 66.7 (2.625) | 27.0 (1.062) | 70.1 (2.761) | 27.0 (1.062) | 72.2 (2.843) | 10.16 (0.400) | No. 18 AWG (0.040") |
| JS | 25.40 (1.000) | 79.4 (3.125) | 27.0 (1.062) | 82.8 (3.261) | 27.0 (1.062) | 84.9 (3.343) | 10.16 (0.400) | No. 18 AWG (0.040") |
| JT | 25.40 (1.000) | 92.1 (3.625) | 27.0 (1.062) | 95.5 (3.761) | 27.0 (1.062) | 97.6 (3.843) | 10.16 (0.400) | No. 18 AWG (0.040") |

## STANDARD RATINGS FOR TYPE 604D

| Rated Capacitance (µF) | Catalog Number | Nominal Case Size D x L (in.) | Maximum ESR +25°C 100kHz (Ω) | Maximum Z +25°C 100kHz (Ω) | Maximum Ripple Current +85°C 100kHz ($A_{rms}$) |
|---|---|---|---|---|---|
| **5 VOLTS DC WORKING; 7 VOLTS DC SURGE** | | | | | |
| 2,700 | 604D272F005GJ2 | 0.750 x 1.625 | 0.146 | 0.110 | 1.50 |
| 3,300 | 604D332F005GL2 | 0.750 x 2.125 | 0.106 | 0.080 | 1.80 |
| 4,700 | 604D472F005GP2 | 0.750 x 2.625 | 0.080 | 0.060 | 2.50 |
| 6,800 | 604D682F005GS2 | 0.750 x 3.125 | 0.062 | 0.047 | 3.10 |
| 3,900 | 604D392F005HJ2 | 0.875 x 1.625 | 0.095 | 0.071 | 1.90 |
| 5,600 | 604D562F005HL2 | 0.875 x 2.125 | 0.070 | 0.053 | 2.50 |
| 6,800 | 604D682F005HP2 | 0.875 x 2.625 | 0.052 | 0.039 | 3.20 |
| 10,000 | 604D103F005HS2 | 0.875 x 3.125 | 0.040 | 0.030 | 4.00 |
| 8,200 | 604D822F005JL2 | 1.000 x 2.125 | 0.049 | 0.037 | 3.50 |
| 15,000 | 604D153F005JP2 | 1.000 x 2.625 | 0.035 | 0.026 | 4.60 |
| 18,000 | 604D183F005JS2 | 1.000 x 3.125 | 0.027 | 0.020 | 5.60 |
| 22,000 | 604D223F005JT2 | 1.000 x 3.625 | 0.022 | 0.017 | 7.00 |
| **7.5 VOLTS DC WORKING; 10 VOLTS DC SURGE** | | | | | |
| 2,200 | 604D222F7R5GJ2 | 0.750 x 1.625 | 0.175 | 0.130 | 1.40 |
| 3,900 | 604D392F7R5GP2 | 0.750 x 2.625 | 0.093 | 0.070 | 2.40 |
| 5,600 | 604D562F7R5GS2 | 0.750 x 3.125 | 0.070 | 0.053 | 3.00 |
| 3,300 | 604D332F7R5HJ2 | 0.875 x 1.625 | 0.117 | 0.087 | 1.80 |
| 4,700 | 604D472F7R5HL2 | 0.875 x 2.125 | 0.080 | 0.059 | 2.40 |
| 6,200 | 604D622F7R5HP2 | 0.875 x 2.625 | 0.061 | 0.046 | 3.10 |
| 8,200 | 604D822F7R5HS2 | 0.875 x 3.125 | 0.047 | 0.035 | 3.80 |
| 5,600 | 604D562F7R5JJ2 | 1.000 x 1.625 | 0.073 | 0.055 | 2.40 |
| 6,800 | 604D682F7R5JL2 | 1.000 x 2.125 | 0.057 | 0.043 | 3.30 |
| 12,000 | 604D123F7R5JP2 | 1.000 x 2.625 | 0.039 | 0.029 | 4.40 |
| 15,000 | 604D153F7R5JS2 | 1.000 x 3.125 | 0.032 | 0.024 | 5.30 |
| 18,000 | 604D183F7R5JT2 | 1.000 x 3.625 | 0.025 | 0.019 | 6.60 |
| **10 VOLTS DC WORKING; 15 VOLTS DC SURGE** | | | | | |
| 1,800 | 604D182F010GJ2 | 0.750 x 1.625 | 0.195 | 0.144 | 1.30 |
| 2,700 | 604D272F010GL2 | 0.750 x 2.125 | 0.144 | 0.107 | 1.70 |
| 3,300 | 604D332F010GP2 | 0.750 x 2.625 | 0.110 | 0.082 | 2.20 |
| 4,700 | 604D472F010GS2 | 0.750 x 3.125 | 0.081 | 0.060 | 2.80 |
| 2,700 | 604D272F010HJ2 | 0.875 x 1.625 | 0.127 | 0.094 | 1.70 |
| 3,900 | 604D392F010HL2 | 0.875 x 2.125 | 0.092 | 0.068 | 2.20 |
| 5,600 | 604D562F010HP2 | 0.875 x 2.625 | 0.069 | 0.051 | 2.90 |
| 6,800 | 604D682F010HS2 | 0.875 x 3.125 | 0.053 | 0.039 | 3.60 |
| 5,600 | 604D562F010JL2 | 1.000 x 2.125 | 0.065 | 0.048 | 3.20 |
| 8,200 | 604D822F010JP2 | 1.000 x 2.625 | 0.044 | 0.033 | 4.10 |
| 10,000 | 604D103F010JS2 | 1.000 x 3.125 | 0.034 | 0.025 | 5.00 |
| 15,000 | 604D153F010JT2 | 1.000 x 3.625 | 0.028 | 0.021 | 6.20 |
| **16 VOLTS DC WORKING; 20 VOLTS DC SURGE** | | | | | |
| 1,500 | 604D152F016GJ2 | 0.750 x 1.625 | 0.207 | 0.149 | 1.20 |
| 2,200 | 604D222F016GL2 | 0.750 x 2.125 | 0.153 | 0.110 | 1.60 |
| 3,900 | 604D392F016GS2 | 0.750 x 3.125 | 0.085 | 0.061 | 2.60 |
| 2,200 | 604D223F016HJ2 | 0.875 x 1.625 | 0.138 | 0.100 | 1.60 |
| 3,300 | 604D332F016HL2 | 0.875 x 2.125 | 0.107 | 0.077 | 2.00 |
| 5,600 | 604D562F016HS2 | 0.875 x 3.125 | 0.056 | 0.041 | 3.30 |
| 8,200 | 604D822F016HT2 | 0.875 x 3.625 | 0.046 | 0.033 | 4.10 |
| 4,700 | 604D472F016JL2 | 1.000 x 2.125 | 0.069 | 0.050 | 2.90 |
| 6,800 | 604D682F016JP2 | 1.000 x 2.625 | 0.048 | 0.035 | 3.90 |
| 10,000 | 604D103F016JS2 | 1.000 x 3.125 | 0.036 | 0.026 | 4.70 |

## STANDARD RATINGS FOR TYPE 604D

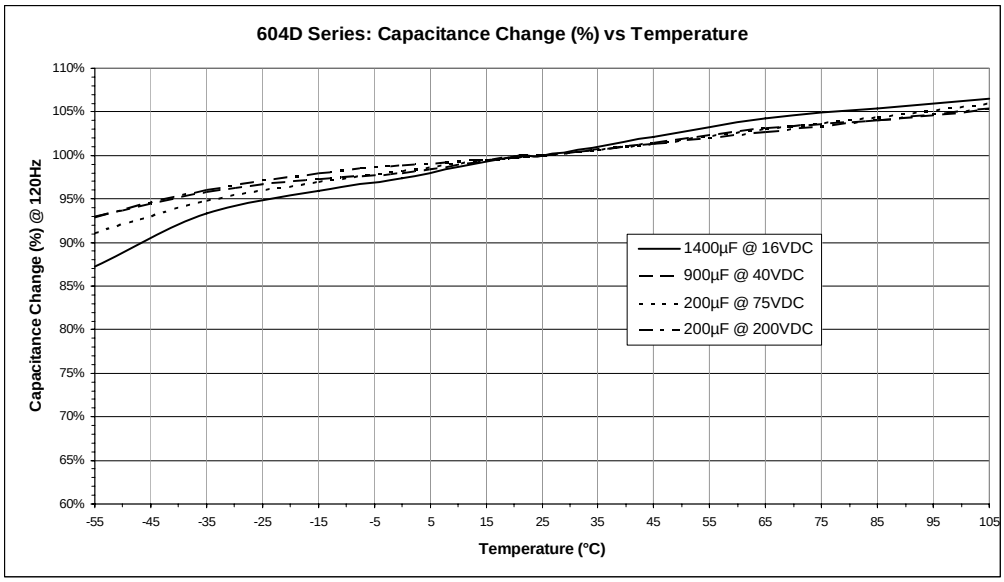
| Rated Capacitance (µF) | Catalog Number | Nominal Case Size D x L (in.) | Maximum ESR +25°C 100kHz (Ω) | Maximum Z +25°C 100kHz (Ω) | Maximum Ripple Current +85°C 100kHz ($A_{rms}$) |
|---|---|---|---|---|---|
| **20 VOLTS DC WORKING; 25 VOLTS DC SURGE** | | | | | |
| 1,200 | 604D122F020GJ2 | 0.750 x 1.625 | 0.240 | 0.170 | 1.20 |
| 2,200 | 604D222F020GP2 | 0.750 x 2.625 | 0.132 | 0.092 | 2.00 |
| 3,300 | 604D332F020GS2 | 0.750 x 3.125 | 0.100 | 0.070 | 2.50 |
| 1,800 | 604D182F020HJ2 | 0.875 x 1.625 | 0.160 | 0.110 | 1.50 |
| 2,700 | 604D272F020HL2 | 0.875 x 2.125 | 0.120 | 0.084 | 1.90 |
| 3,900 | 604D392F020HP2 | 0.875 x 2.625 | 0.085 | 0.060 | 2.60 |
| 5,600 | 604D562F020HS2 | 0.875 x 3.125 | 0.064 | 0.045 | 3.80 |
| 4,700 | 604D472F020JL2 | 1.000 x 2.125 | 0.078 | 0.055 | 2.70 |
| 6,800 | 604D682F020JP2 | 1.000 x 2.625 | 0.055 | 0.039 | 3.50 |
| 8,200 | 604D822F020JS2 | 1.000 x 3.125 | 0.042 | 0.030 | 4.50 |
| 10,000 | 604D103F020JT2 | 1.000 x 3.625 | 0.034 | 0.024 | 5.50 |
| **25 VOLTS DC WORKING; 30 VOLTS DC SURGE** | | | | | |
| 1,000 | 604D012F025GJ2 | 0.750 x 1.625 | 0.320 | 0.224 | 1.05 |
| 1,200 | 604D122F025GL2 | 0.750 x 2.125 | 0.240 | 0.168 | 1.40 |
| 1,800 | 604D182F025GP2 | 0.750 x 2.625 | 0.180 | 0.126 | 1.75 |
| 2,200 | 604D222F025HL2 | 0.875 x 2.125 | 0.145 | 0.102 | 1.90 |
| 3,300 | 604D332F025HP2 | 0.875 x 2.625 | 0.108 | 0.072 | 3.00 |
| 2,700 | 604D272F025JL2 | 1.000 x 2.125 | 0.116 | 0.081 | 2.40 |
| 4,700 | 604D472F025JP2 | 1.000 x 2.625 | 0.080 | 0.056 | 3.25 |
| 6,800 | 604D682F025JS2 | 1.000 x 3.125 | 0.062 | 0.043 | 4.00 |
| 8,200 | 604D822F025JT2 | 1.000 x 3.625 | 0.051 | 0.036 | 4.65 |
| **30 VOLTS DC WORKING; 40 VOLTS DC SURGE** | | | | | |
| 820 | 604D821F030GJ2 | 0.750 x 1.625 | 0.380 | 0.262 | 1.00 |
| 1,000 | 604D102F030GL2 | 0.750 x 2.125 | 0.295 | 0.204 | 1.25 |
| 1,500 | 604D153F030GP2 | 0.750 x 2.625 | 0.204 | 0.141 | 1.70 |
| 1,800 | 604D182F030HL2 | 0.875 x 2.125 | 0.165 | 0.114 | 1.75 |
| 2,700 | 604D272F030HP2 | 0.875 x 2.625 | 0.120 | 0.083 | 2.35 |
| 3,900 | 604D392F030HS2 | 0.875 x 3.125 | 0.088 | 0.061 | 2.90 |
| 2,200 | 604D222F030JL2 | 1.000 x 2.125 | 0.133 | 0.092 | 2.25 |
| 3,300 | 604D332F030JP2 | 1.000 x 2.625 | 0.095 | 0.056 | 3.00 |
| 4,700 | 604D472F030JS2 | 1.000 x 3.125 | 0.074 | 0.051 | 3.60 |
| 5,600 | 604D562F030JT2 | 1.000 x 3.625 | 0.059 | 0.041 | 4.40 |
| **40 VOLTS DC WORKING; 50 VOLTS DC SURGE** | | | | | |
| 680 | 604D681F040GJ2 | 0.750 x 1.625 | 0.480 | 0.322 | 0.90 |
| 820 | 604D821F040GL2 | 0.750 x 2.125 | 0.380 | 0.255 | 1.15 |
| 1,000 | 604D102F040HJ2 | 0.875 x 1.625 | 0.295 | 0.197 | 1.20 |
| 1,500 | 604D152F040HL2 | 0.875 x 2.125 | 0.220 | 0.147 | 1.55 |
| 2,200 | 604D222F040HP2 | 0.875 x 2.625 | 0.155 | 0.104 | 2.15 |
| 3,300 | 604D332F040HS2 | 0.875 x 3.125 | 0.115 | 0.077 | 2.60 |
| 1,800 | 604D182F040JL2 | 1.000 x 2.125 | 0.175 | 0.117 | 2.05 |
| 3,900 | 604D392F040JS2 | 1.000 x 3.125 | 0.091 | 0.061 | 3.40 |
| 4,700 | 604D472F040JT2 | 1.000 x 3.625 | 0.074 | 0.050 | 4.10 |
| **50 VOLTS DC WORKING; 75 VOLTS DC SURGE** | | | | | |
| 470 | 604D471F050GJ2 | 0.750 x 1.625 | 0.430 | 0.280 | 0.93 |
| 560 | 604D561F050GL2 | 0.750 x 2.125 | 0.325 | 0.212 | 1.15 |
| 680 | 604D681F050HJ2 | 0.875 x 1.625 | 0.245 | 0.160 | 1.25 |
| 820 | 604D821F050HL2 | 0.875 x 2.125 | 0.185 | 0.120 | 1.60 |
| 1,200 | 604D122F050HP2 | 0.875 x 2.625 | 0.130 | 0.085 | 2.15 |
| 1,000 | 604D102F050JL2 | 1.000 x 2.125 | 0.150 | 0.098 | 2.10 |

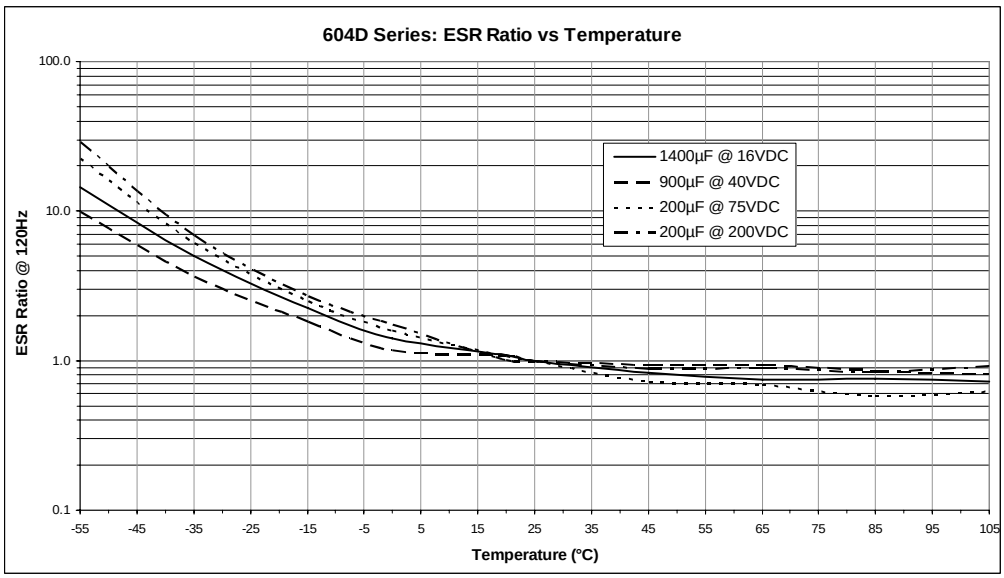
## STANDARD RATINGS FOR TYPE 604D

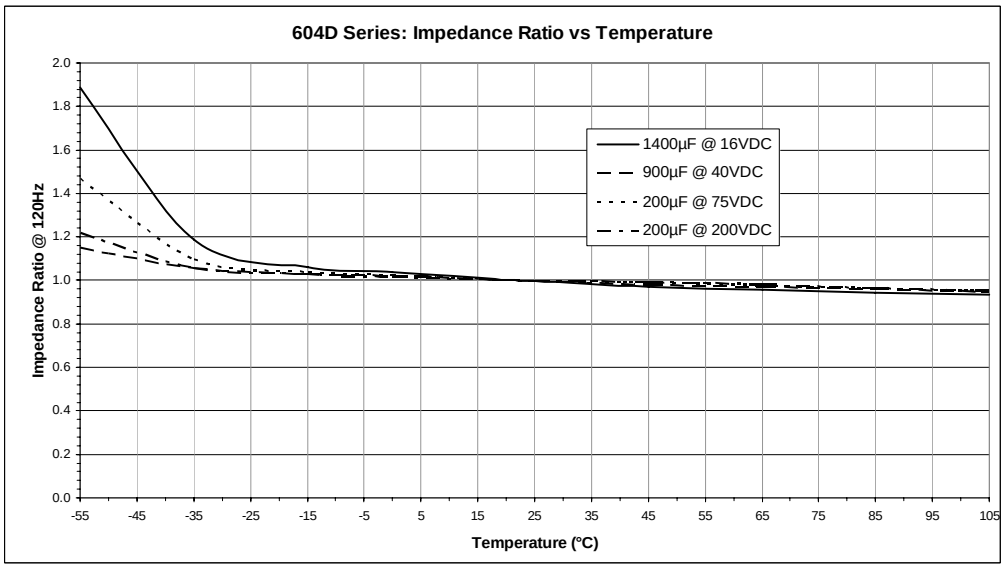
| Rated Capacitance (µF) | Catalog Number | Nominal Case Size D x L (in.) | Maximum ESR +25°C 100kHz (Ω) | Maximum Z +25°C 100kHz (Ω) | Maximum Ripple Current +85°C 100kHz ($A_{rms}$) |
|---|---|---|---|---|---|
| **50 VOLTS DC WORKING; 75 VOLTS DC SURGE (CONTINUED)** | | | | | |
| 1,500 | 604D152F050JP2 | 1.000 x 2.625 | 0.108 | 0.070 | 2.80 |
| 2,200 | 604D222F050JS2 | 1.000 x 3.125 | 0.081 | 0.053 | 3.40 |
| 3,300 | 604D332F050JT2 | 1.000 x 3.625 | 0.065 | 0.042 | 4.25 |
| **75 VOLTS DC WORKING; 100 VOLTS DC SURGE** | | | | | |
| 220 | 604D221F075GJ2 | 0.750 x 1.625 | 0.650 | 0.384 | 0.78 |
| 270 | 604D271F075GL2 | 0.750 x 2.125 | 0.500 | 0.295 | 1.00 |
| 390 | 604D391F075HJ2 | 0.875 x 1.625 | 0.370 | 0.218 | 1.10 |
| 560 | 604D561F075HL2 | 0.875 x 2.125 | 0.290 | 0.171 | 1.40 |
| 820 | 604D821F075HP2 | 0.875 x 2.625 | 0.200 | 0.118 | 1.95 |
| 1,000 | 604D102F075HS2 | 0.875 x 3.125 | 0.153 | 0.090 | 2.25 |
| 680 | 604D681F075JL2 | 1.000 x 2.125 | 0.230 | 0.136 | 1.85 |
| 1,500 | 604D152F075JS2 | 1.000 x 3.125 | 0.130 | 0.077 | 2.95 |
| 1,800 | 604D182F075JT2 | 1.000 x 3.625 | 0.100 | 0.059 | 3.55 |
| **100 VOLTS DC WORKING; 125 VOLTS DC SURGE** | | | | | |
| 150 | 604D151F100GJ2 | 0.750 x 1.625 | 1.000 | 0.530 | 0.70 |
| 180 | 604D181F100GL2 | 0.750 x 2.125 | 0.765 | 0.405 | 0.90 |
| 270 | 604D271F100HJ2 | 0.875 x 1.625 | 0.565 | 0.300 | 0.93 |
| 390 | 604D391F100HL2 | 0.875 x 2.125 | 0.435 | 0.230 | 1.20 |
| 560 | 604D561F100HP2 | 0.875 x 2.625 | 0.300 | 0.159 | 1.60 |
| 470 | 604D471F100JL2 | 1.000 x 2.125 | 0.340 | 0.180 | 1.55 |
| 820 | 604D821F100JP2 | 1.000 x 2.625 | 0.235 | 0.125 | 2.10 |
| 1,000 | 604D102F100JS2 | 1.000 x 3.125 | 0.185 | 0.098 | 2.65 |
| 1,200 | 604D122F100JT2 | 1.000 x 3.625 | 0.150 | 0.080 | 3.15 |
| **200 VOLTS DC WORKING; 250 VOLTS DC SURGE** | | | | | |
| 47 | 604D470F200GJ2 | 0.750 x 1.625 | 2.600 | 0.780 | 0.60 |
| 82 | 604D820F200GJ2 | 0.750 x 1.625 | 1.530 | 0.460 | 0.75 |
| 120 | 604D121F200HL2 | 0.875 x 2.125 | 1.300 | 0.390 | 0.95 |
| 180 | 604D181F200HP2 | 0.875 x 2.625 | 0.865 | 0.259 | 1.25 |
| 270 | 604D271F200HT2 | 0.875 x 3.625 | 0.520 | 0.156 | 1.90 |
| 220 | 604D221F200JP2 | 1.000 x 2.625 | 0.650 | 0.195 | 1.67 |
| 390 | 604D391F200JT2 | 1.000 x 3.625 | 0.405 | 0.122 | 2.50 |

# 604D TYPICAL PERFORMANCE PROFILES

## TEMPERATURE CHARACTERISTICS



# 604D TYPICAL PERFORMANCE PROFILES

## FREQUENCY CHARACTERISTICS