

# F97 Series



## Resin-Molded Chip, Improved Reliability J-Lead



### FEATURES

- Compliant to the RoHS2 directive 2011/65/EU
- Compliant to AEC-Q200
- Improved reliability - FR=0.5%/1000hrs (twice better than standard)
- SMD J-lead

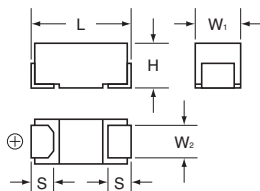
### APPLICATIONS

- Automotive electronics(Engine ECU)
- Industrial equipment

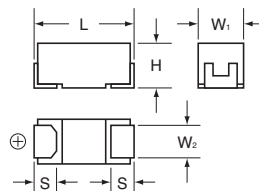
### CASE DIMENSIONS: millimeters (inches)

| Code     | L                              | W <sub>1</sub>                 | W <sub>2</sub>                 | H                              | S                              |
|----------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
| <b>A</b> | 3.20 ± 0.20<br>(0.126 ± 0.008) | 1.60 ± 0.20<br>(0.063 ± 0.008) | 1.20 ± 0.10<br>(0.047 ± 0.004) | 1.60 ± 0.20<br>(0.063 ± 0.008) | 0.80 ± 0.20<br>(0.031 ± 0.008) |
| <b>B</b> | 3.50 ± 0.20<br>(0.126 ± 0.008) | 2.80 ± 0.20<br>(0.110 ± 0.008) | 2.20 ± 0.10<br>(0.087 ± 0.004) | 1.90 ± 0.20<br>(0.075 ± 0.008) | 0.80 ± 0.20<br>(0.031 ± 0.008) |
| <b>C</b> | 6.00 ± 0.20<br>(0.236 ± 0.008) | 3.20 ± 0.20<br>(0.126 ± 0.008) | 2.20 ± 0.10<br>(0.087 ± 0.004) | 2.50 ± 0.20<br>(0.098 ± 0.008) | 1.30 ± 0.20<br>(0.051 ± 0.008) |
| <b>N</b> | 7.30 ± 0.20<br>(0.287 ± 0.008) | 4.30 ± 0.20<br>(0.169 ± 0.008) | 2.40 ± 0.10<br>(0.094 ± 0.004) | 2.80 ± 0.20<br>(0.110 ± 0.008) | 1.30 ± 0.20<br>(0.051 ± 0.008) |

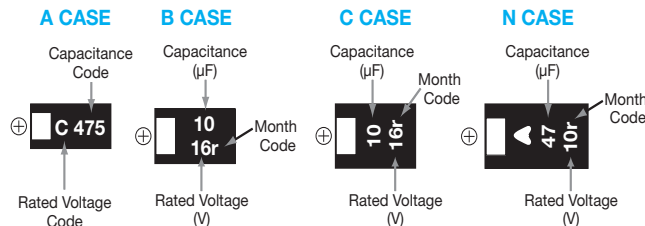
**A, B CASE**



**C, N CASE**



### MARKING



### HOW TO ORDER

|            |               |  |                      |                 |                          |
|------------|---------------|--|----------------------|-----------------|--------------------------|
| <b>F97</b> | <b>1C</b>     | <b>335</b>   | <b>M</b>             | <b>A</b>        |                          |
| Type       | Rated Voltage | Capacitance Code   | Tolerance            | Case Size       | Packaging                |
|            |               | pF code: 1st two digits represent the significant figures, 3rd digit represents multiplier (number of zeros to follow) | K = ±10%<br>M = ±20% | See table above | See page 168 for details |

### TECHNICAL SPECIFICATIONS

| Item                              | Performance Characteristics   |
|-----------------------------------|---|
| Category Temperature Range        | -55 to +125°C (Rated temperature: +85°C)  |
| Capacitance Tolerance             | ±20%, ±10% (at 120Hz)   |
| Dissipation Factor                | Refer to next page  |
| ESR (100kHz)                      | Refer to next page  |
| Leakage Current                   | <ul style="list-style-type: none"> <li>• After 1 minute's application of rated voltage, leakage current at 20°C is not more than 0.01CV or 0.5µA, whichever is greater.</li> <li>• After 1 minute's application of rated voltage, leakage current at 85°C is not more than 0.1CV or 5µA, whichever is greater.</li> <li>• After 1 minute's application of derated voltage, leakage current at 125°C is not more than 0.125CV or 6.3µA, whichever is greater.</li> </ul> |
| Capacitance Change by Temperature | +15% Max. (at +125°C)<br>+10% Max. (at +85°C)<br>-10% Max. (at -55°C)   |
| Damp Heat (Steady State)          | At 85°C, 85% R.H., For 1000 hours (No voltage applied)<br>Capacitance Change ..... Within ±10% of the initial value<br>Dissipation Factor ..... Initial specified value or less<br>Leakage Current ..... 125% or less than the initial specified value  |
| Load Humidity                     | After 1000 hour's application of rated voltage in series with a 33Ω resistor at 85°C, 85% R.H., capacitors meet the characteristics requirements table below.<br>Capacitance Change ..... Within ±10% of the initial value<br>Dissipation Factor ..... 120% or less than the initial specified value<br>Leakage Current ..... 200% or less than the initial specified value   |
| Temperature Cycles                | At -55°C / +125°C, For 30 minutes each, 1000 cycles<br>Capacitance Change ..... Within ±5% of the initial value<br>Dissipation Factor ..... Initial specified value or less<br>Leakage Current ..... Initial specified value or less  |
| Resistance to Soldering Heat      | 10 seconds reflow at 260°C, 5 seconds immersion at 260°C.<br>Capacitance Change ..... Within ±5% of the initial value<br>Dissipation Factor ..... Initial specified value or less<br>Leakage Current ..... Initial specified value or less  |
| Solderability                     | After immersing capacitors completely into a solder pot at 245°C for 2 to 3 seconds, more than 3/4 of their electrode area shall remain covered with new solder.  |
| Surge                             | After application of surge voltage in series with a 33Ω resistor at the rate of 30 seconds ON, 30 seconds OFF, for 1000 successive test cycles at 85°C, capacitors shall meet the characteristic requirements table below.<br>Capacitance Change ..... Within ±5% of the initial value<br>Dissipation Factor ..... Initial specified value or less<br>Leakage Current ..... Initial specified value or less   |
| Endurance                         | After 2000 hours' application of rated voltage in series with a 3Ω resistor at 85°C, or derated voltage in series with a 3Ω resistor at 125°C, capacitors shall meet the characteristic requirements table below.<br>Capacitance Change ..... Within ±10% of the initial value<br>Dissipation Factor ..... Initial specified value or less<br>Leakage Current ..... Initial specified value or less   |
| Shear Test                        | After applying the pressure load of 5N for 10 ±1 seconds horizontally to the center of capacitor side body which has no electrode and has been soldered beforehand on a substrate, there shall be found neither exfoliation nor its sign at the terminal electrode.<br>   |
| Terminal Strength                 | Keeping a capacitor surface-mounted on a substrate upside down and supporting the substrate at both of the opposite bottom points 45mm apart from the center of capacitor, the pressure strength is applied with a specified jig at the center of the substrate so that substrate may bend by 1mm as illustrated. Then, there shall be found no remarkable abnormality on the capacitor terminals.<br>  |
| Failure Rate                      | 0.5% per 1000 hours at 85°C, VR with 0.1 / V series impedance, 60% confidence level.  |



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### CAPACITANCE AND RATED VOLTAGE RANGE (LETTER DENOTES CASE SIZE)

| Capacitance |      | Rated Voltage |          |          |          |          |          |
|-------------|------|---------------|----------|----------|----------|----------|----------|
| μF          | Code | 6.3V (0J)     | 10V (1A) | 16V (1C) | 20V (1D) | 25V (1E) | 35V (1V) |
| 0.47        | 474  |               |          |          |          |          | A        |
| 0.68        | 684  |               |          |          | A        | A        | A        |
| 1           | 105  |               |          | A        | A        | A        | A*       |
| 1.5         | 155  |               |          | A        | A        |          | A*/B     |
| 2.2         | 225  |               | A        | A        | A        | A*/B     | B        |
| 3.3         | 335  | A             | A        | A        | B        | B        | B*/C     |
| 4.7         | 475  | A             | A/B      | A/B      | A/B      | B*/C     | C        |
| 6.8         | 685  | A/B           | B        | B        | B*/C     | C        | C*/N     |
| 10          | 106  |               | A/B      | A/B/C    | B*/C     | C/N      | N        |
| 15          | 156  | B             | B        | B*/C     | N        | C*/N     |          |
| 22          | 226  | A/B           | A/B      | B/C/N    | C/N      | N*       |          |
| 33          | 336  | A/C           | B/C/N    | B/C/N    |          | N*       |          |
| 47          | 476  | B/C           | B*/C/N   | C/N      |          |          |          |
| 68          | 686  | N             | N        |          |          |          |          |
| 100         | 107  | N             | C/N*     |          |          |          |          |

Available Ratings

\*Codes under development – subject to change

Please contact to your local AVX sales office when these series are being designed in your application.

# F97 Series



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### RATINGS & PART NUMBER REFERENCE

| AVX Part Number | Case Size | Cap (μF) | Rated Voltage (V) | Leakage Current (μA) | Dissipation Factor (%@120Hz) | ESR (Ω@100kHz) |
|-----------------|-----------|----------|-------------------|----------------------|------------------------------|----------------|
| <b>6.3 Volt</b> |           |          |                   |                      |                              |                |
| F970J335MAA     | A         | 3.3      | 6.3               | 0.5                  | 4                            | 4.5            |
| F970J475MAA     | A         | 4.7      | 6.3               | 0.5                  | 6                            | 4.0            |
| F970J685MAA     | A         | 6.8      | 6.3               | 0.5                  | 6                            | 3.5            |
| F970J685MBA     | B         | 6.8      | 6.3               | 0.5                  | 6                            | 2.5            |
| F970J156MBA     | B         | 15       | 6.3               | 0.9                  | 6                            | 2.0            |
| F970J226MAA     | A         | 22       | 6.3               | 1.4                  | 12                           | 2.5            |
| F970J226MBA     | B         | 22       | 6.3               | 1.4                  | 8                            | 1.9            |
| F970J336MAA     | A         | 33       | 6.3               | 2.1                  | 12                           | 2.5            |
| F970J336MCC     | C         | 33       | 6.3               | 2.1                  | 6                            | 1.1            |
| F970J476MBA     | B         | 47       | 6.3               | 3.0                  | 8                            | 1.0            |
| F970J476MCC     | C         | 47       | 6.3               | 3.0                  | 6                            | 0.9            |
| F970J686MNC     | N         | 68       | 6.3               | 4.3                  | 6                            | 0.6            |
| F970J107MNC     | N         | 100      | 6.3               | 6.3                  | 8                            | 0.6            |
| <b>10 Volt</b>  |           |          |                   |                      |                              |                |
| F971A225MAA     | A         | 2.2      | 10                | 0.5                  | 4                            | 5.0            |
| F971A335MAA     | A         | 3.3      | 10                | 0.5                  | 4                            | 4.5            |
| F971A475MAA     | A         | 4.7      | 10                | 0.5                  | 6                            | 4.0            |
| F971A475MBA     | B         | 4.7      | 10                | 0.5                  | 6                            | 2.8            |
| F971A685MBA     | B         | 6.8      | 10                | 0.7                  | 6                            | 2.5            |
| F971A106MAA     | A         | 10       | 10                | 1.0                  | 6                            | 3.0            |
| F971A106MBA     | B         | 10       | 10                | 1.0                  | 6                            | 2.0            |
| F971A156MBA     | B         | 15       | 10                | 1.5                  | 6                            | 2.0            |
| F971A226MAA     | A         | 22       | 10                | 2.2                  | 15                           | 3.0            |
| F971A226MBA     | B         | 22       | 10                | 2.2                  | 8                            | 1.9            |
| F971A336MBA     | B         | 33       | 10                | 3.3                  | 8                            | 1.9            |
| F971A336MCC     | C         | 33       | 10                | 3.3                  | 6                            | 1.1            |
| F971A336MNC     | N         | 33       | 10                | 3.3                  | 6                            | 0.7            |
| F971A476MCC     | C         | 47       | 10                | 4.7                  | 8                            | 0.9            |
| F971A476MNC     | N         | 47       | 10                | 4.7                  | 6                            | 0.7            |
| F971A686MNC     | N         | 68       | 10                | 6.8                  | 6                            | 0.6            |
| F971A107MCC     | C         | 100      | 10                | 10.0                 | 10                           | 0.7            |
| <b>16 Volt</b>  |           |          |                   |                      |                              |                |
| F971C105MAA     | A         | 1        | 16                | 0.5                  | 4                            | 7.5            |
| F971C155MAA     | A         | 1.5      | 16                | 0.5                  | 4                            | 6.3            |
| F971C225MAA     | A         | 2.2      | 16                | 0.5                  | 4                            | 5.0            |
| F971C335MAA     | A         | 3.3      | 16                | 0.5                  | 4                            | 4.5            |
| F971C475MAA     | A         | 4.7      | 16                | 0.8                  | 8                            | 4.0            |
| F971C475MBA     | B         | 4.7      | 16                | 0.8                  | 6                            | 2.8            |
| F971C685MBA     | B         | 6.8      | 16                | 1.1                  | 6                            | 2.5            |
| F971C106MAA     | A         | 10       | 16                | 1.6                  | 8                            | 3.5            |
| F971C106MBA     | B         | 10       | 16                | 1.6                  | 6                            | 2.1            |

| AVX Part Number | Case Size | Cap (μF) | Rated Voltage (V) | Leakage Current (μA) | Dissipation Factor (%@120Hz) | ESR (Ω@100kHz) |
|-----------------|-----------|----------|-------------------|----------------------|------------------------------|----------------|
| F971C106MCC     | C         | 10       | 16                | 1.6                  | 6                            | 1.5            |
| F971C156MCC     | C         | 15       | 16                | 2.4                  | 6                            | 1.2            |
| F971C226MBA     | B         | 22       | 16                | 3.5                  | 8                            | 1.9            |
| F971C226MCC     | C         | 22       | 16                | 3.5                  | 8                            | 1.1            |
| F971C226MNC     | N         | 22       | 16                | 3.5                  | 6                            | 0.7            |
| F971C336MBA     | B         | 33       | 16                | 5.3                  | 10                           | 2.1            |
| F971C336MCC     | C         | 33       | 16                | 5.3                  | 8                            | 1.1            |
| F971C336MNC     | N         | 33       | 16                | 5.3                  | 6                            | 0.7            |
| F971C476MCC     | C         | 47       | 16                | 7.5                  | 10                           | 1.1            |
| F971C476MNC     | N         | 47       | 16                | 7.5                  | 8                            | 0.7            |
| <b>20 Volt</b>  |           |          |                   |                      |                              |                |
| F971D684MAA     | A         | 0.68     | 20                | 0.5                  | 4                            | 7.6            |
| F971D105MAA     | A         | 1        | 20                | 0.5                  | 4                            | 7.5            |
| F971D155MAA     | A         | 1.5      | 20                | 0.5                  | 4                            | 6.7            |
| F971D225MAA     | A         | 2.2      | 20                | 0.5                  | 6                            | 6.3            |
| F971D335MBA     | B         | 3.3      | 20                | 0.7                  | 4                            | 3.1            |
| F971D475MAA     | A         | 4.7      | 20                | 0.9                  | 8                            | 4.0            |
| F971D475MBA     | B         | 4.7      | 20                | 0.9                  | 6                            | 2.8            |
| F971D685MCC     | C         | 6.8      | 20                | 1.4                  | 6                            | 1.8            |
| F971D106MCC     | C         | 10       | 20                | 2.0                  | 6                            | 1.5            |
| F971D156MNC     | N         | 15       | 20                | 3.0                  | 6                            | 0.7            |
| F971D226MCC     | C         | 22       | 20                | 4.4                  | 8                            | 1.1            |
| F971D226MNC     | N         | 22       | 20                | 4.4                  | 6                            | 0.7            |
| <b>25 Volt</b>  |           |          |                   |                      |                              |                |
| F971E684MAA     | A         | 0.68     | 25                | 0.5                  | 4                            | 7.6            |
| F971E105MAA     | A         | 1        | 25                | 0.5                  | 4                            | 7.5            |
| F971E225MBA     | B         | 2.2      | 25                | 0.6                  | 4                            | 3.8            |
| F971E335MBA     | B         | 3.3      | 25                | 0.8                  | 4                            | 3.5            |
| F971E475MCC     | C         | 4.7      | 25                | 1.2                  | 6                            | 1.8            |
| F971E685MCC     | C         | 6.8      | 25                | 1.7                  | 6                            | 1.8            |
| F971E106MCC     | C         | 10       | 25                | 2.5                  | 6                            | 1.6            |
| F971E106MNC     | N         | 10       | 25                | 2.5                  | 6                            | 1.0            |
| F971E156MNC     | N         | 15       | 25                | 3.8                  | 6                            | 0.7            |
| <b>35 Volt</b>  |           |          |                   |                      |                              |                |
| F971V474MAA     | A         | 0.47     | 35                | 0.5                  | 4                            | 10.0           |
| F971V684MAA     | A         | 0.68     | 35                | 0.5                  | 4                            | 7.6            |
| F971V155MBA     | B         | 1.5      | 35                | 0.5                  | 4                            | 4.0            |
| F971V225MBA     | B         | 2.2      | 35                | 0.8                  | 4                            | 3.8            |
| F971V335MCC     | C         | 3.3      | 35                | 1.2                  | 4                            | 2.0            |
| F971V475MCC     | C         | 4.7      | 35                | 1.6                  | 6                            | 1.8            |
| F971V685MNC     | N         | 6.8      | 35                | 2.4                  | 6                            | 1.0            |
| F971V106MNC     | N         | 10       | 35                | 3.5                  | 6                            | 1.0            |

\* In case of capacitance tolerance  $\pm 10\%$  type, "K" will be put at 9th digit of type numbering system