



**AVX**

**Glass Dielectric Capacitors**

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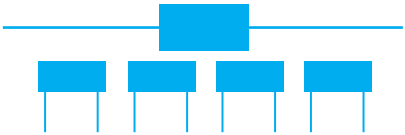
|                                   |    |
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### Elevated Temperature (ET Series)

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- Placement of Orders
  - Price Quotations
  - Delivery
  - Specifications of Drawing Reviews
  - Location of Franchised Distributors
  - Technical Information
    - Product Capabilities
    - Applications Assistance

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**AVX/Kyocera: your source for multilayer capacitors, glass capacitors, and tantalum capacitors.**  
**See other MLC parts in AVX's standard Leaded and Chip catalogs.**

# Glass-K/Glass Caps



## Military Cross Reference and Alphabetical Parts Listing

### CAPACITORS – ALPHABETICAL LISTING OF MILITARY PART NUMBERS

| Military Part No. | AVX Part No. | Component Type    | Page No. | Military Part No. | AVX Part No. | Component Type  | Page No. |
|-------------------|--------------|-------------------|----------|-------------------|--------------|-----------------|----------|
| CK31              | CK31         | Glass-K Capacitor | 26       | CY10              | CY10         | Glass Capacitor | 8        |
| CK32              | CK32         | Glass-K Capacitor | 26       | CY15              | CY15         | Glass Capacitor | 8        |
| CKR31             | CKR31        | Glass-K Capacitor | 28       | CYR10             | CYR10        | Glass Capacitor | 14       |
| CKR32             | CKR32        | Glass-K Capacitor | 28       | CYR15             | CYR15        | Glass Capacitor | 14       |
| CY06              | CY06         | Glass Capacitor   | 10       | CYR51             | CYR51        | Glass Capacitor | 16       |
| CY07              | CY07         | Glass Capacitor   | 10       | CYR52             | CYR52        | Glass Capacitor | 16       |
| CY08              | CY08         | Glass Capacitor   | 10       | CYR53             | CYR53        | Glass Capacitor | 16       |

### CAPACITORS – MILITARY SPECIFICATION CROSS-REFERENCE

| Military Specification | Military Part No. | AVX Part No. | Page No. | Military Specification    | Military Part No. | AVX Part No. | Page No. |
|------------------------|-------------------|--------------|----------|---------------------------|-------------------|--------------|----------|
| MIL-C-11015            | CK31              | CK31         | 26       | MIL-C-39014               | CKR31             | CKR31        | 28       |
| (Ceramic Capacitors)   | CK32              | CK32         | 26       | (Established Reliability) | CKR32             | CKR32        | 28       |
| MIL-C-11272            | CY06              | CY06         | 10       | (Ceramic Capacitors)      |                   |              |          |
| (Glass Capacitors)     | CY07              | CY07         | 10       | MIL-C-23269               | CYR10             | CYR10        | 14       |
|                        | CY08              | CY08         | 10       | (Established Reliability) | CYR15             | CYR15        | 14       |
|                        | CY10              | CY10         | 8        | (Glass Capacitors)        | CYR51             | CYR51        | 16       |
|                        | CY15              | CY15         | 8        |                           | CYR52             | CYR52        | 16       |
|                        |                   |              |          |                           | CYR53             | CYR53        | 16       |

### CAPACITORS – ALPHABETICAL LISTING OF AVX PART NUMBERS

| AVX Part No. | Military Part No. | Component Type    | Page No. | Military Part No. | AVX Part No. | Component Type    | Page No. |
|--------------|-------------------|-------------------|----------|-------------------|--------------|-------------------|----------|
| CK31         | CK31              | Glass-K Capacitor | 26       | CYR51             | CYR51        | Glass Capacitor   | 16       |
| CK32         | CK32              | Glass-K Capacitor | 26       | CYR52             | CYR52        | Glass Capacitor   | 16       |
| CKR31        | CKR31             | Glass-K Capacitor | 28       | CYR53             | CYR53        | Glass Capacitor   | 16       |
| CKR32        | CKR32             | Glass-K Capacitor | 28       | ET10              | None         | Glass Capacitor   | 20       |
| CY06         | CY06              | Glass Capacitor   | 10       | ET15              | None         | Glass Capacitor   | 20       |
| CY07         | CY07              | Glass Capacitor   | 10       | ETR10             | None         | Glass Capacitor   | 20       |
| CY08         | CY08              | Glass Capacitor   | 10       | ETR15             | None         | Glass Capacitor   | 20       |
| CY10         | CY10              | Glass Capacitor   | 8        | ET31              | None         | Glass-K Capacitor | 32       |
| CY15         | CY15              | Glass Capacitor   | 8        | ET32              | None         | Glass-K Capacitor | 32       |
| CYFR10       | None              | Glass Capacitor   | 12       | ET06              | None         | Glass Capacitor   | 22       |
| CYFR15       | None              | Glass Capacitor   | 12       | ET07              | None         | Glass Capacitor   | 22       |
| CYR10        | CYR10             | Glass Capacitor   | 14       | ET08              | None         | Glass Capacitor   | 22       |
| CYR15        | CYR15             | Glass Capacitor   | 14       |                   |              |                   |          |

# Glass-K/Glass Caps



## Selector Guide

| CAPACITOR CHARACTERISTICS |                                      | DIELECTRIC TYPES                 |                                     |                                                            |                                                            |                                                                         |                                                              |
|---------------------------|--------------------------------------|----------------------------------|-------------------------------------|------------------------------------------------------------|------------------------------------------------------------|-------------------------------------------------------------------------|--------------------------------------------------------------|
|                           |                                      | GLASS                            |                                     | ELEVATED TEMPERATURE GLASS                                 |                                                            | ET GLASS-K                                                              | GLASS-K                                                      |
| AVX TYPES                 |                                      | CY10-15<br>CYFR10-15<br>CYR10-15 | CY06-08<br>CYR51-53                 | ET10<br>ET15                                               | ET06<br>ET07<br>ET08                                       | ET31<br>ET32                                                            | CK31, 32<br>CKR31, 32                                        |
| Capacitance               | Capacitance Range                    | .5 - 1200 pF                     | 1 - 2400 pF                         | 0.5 to 1200 pF                                             | 1.0 to 2400 pF                                             | 270 - 100,000pF                                                         | 270 - 100,000pF                                              |
|                           | Standard Tolerance                   | ±1 to 20%<br>CYR ±1 to 5%        | TY0<br>±1 to 20%<br>CYR<br>±1 to 5% | ±.25 to ±20%                                               | ±.25 to ±20%                                               | ±10 or 20%                                                              | ±10 or 20%                                                   |
|                           | Minimum Tolerance                    | ±1% or ±.25pF                    | ±1% or ±.25pF                       | ±.25%                                                      | ±.25%                                                      | ±5% on "2" Char.                                                        | ±5% on "T" Char.<br>others ±10%                              |
| Volts                     | DC Operating Volts                   | 300 VDC and 500 VDC              | 300 VDC                             | 50 VDC                                                     | 50 VDC                                                     | 25 VDC                                                                  | 50 VDC                                                       |
| Frequency                 | Operating Frequency                  | DC to UHF                        | DC to UHF                           | DC to VHF                                                  | DC to VHF                                                  | DC to VHF                                                               | DC to VHF                                                    |
| Disipation Factor         | % @ 1kHz<br>>100pF<br>1MHz<br><100pF | .1%<br>@ 25°C                    | .1%>100pF<br>.2%<100pF              | @ 25°C<br>1kHz: .1%<br>@ 200°C<br>1kHz: 1%                 | @ 25°C<br>1kHz: <.1%<br>@ 200°C<br>1kHz: <1%               | 1 - 3% @ 25°C<br>1.5 - 4% @ 200°C                                       | 1 to 3%                                                      |
| Insulation Resistance     | Meg Ω                                | 500,000<br>100,000<br>@25°C      | 100,000<br>@25°C                    | >100,000<br>@ 25°C<br>>1 x 10 <sup>8</sup> Ohms<br>@ 200°C | >100,000<br>@ 25°C<br>>1 x 10 <sup>8</sup> Ohms<br>@ 200°C | >1 x 10 <sup>11</sup><br>@ 25°C<br>>1 x 10 <sup>8</sup> Ohms<br>@ 200°C | 100,000<br>Meg Ω<br>or<br>1000 MΩ - μF,<br>whichever is less |
| Temperature               | Operating Range                      | -55°C to +125°C                  | -55°C to +125°C                     | -75°C to +200°C                                            | -75°C to +200°C                                            | -75°C to +200°C                                                         | -55°C to +125°C                                              |
|                           | Temperature Characteristics          | +140 ±25 PPM/°C                  | +140 ±25 PPM/°C                     | +140 PPM ±25 PPM/°C                                        | +140 PPM ±25 PPM/°C                                        | +3, -25 or +3, -35 or +21, -50                                          | +2, -10 or +2, -15 or +20, -45%                              |
| Form Factor               | Lead Type                            | Axial                            | Radial                              | Axial                                                      | Radial                                                     | Axial                                                                   | Axial                                                        |
| MIL-SPECS MIL-C-          |                                      | 11272 and 23269                  | 11272 and 23269                     | —                                                          | —                                                          | —                                                                       | CK31, 32 (11015/25)<br>CKR31, 32 (39014/21)                  |
| CATALOG PAGE NUMBERS      |                                      | 8, 12, 14                        | 10, 16                              | 20                                                         | 22                                                         | 32                                                                      | 26, 28                                                       |

# Glass Capacitors

## Introduction

### INTRODUCTION

#### For the 1% of designs where you can't stand failures:

In most types of electronic equipment, the occasional failure of a capacitor is tolerable – though it is inconvenient and often costly. For these applications, an acceptable level of reliability is provided by many of the excellent types of capacitors available today.

**But in a few designs you can't stand failures** – satellite systems, undersea cable repeaters, mountaintop microwave relay stations, to name just a few. For these designs AVX glass capacitors may be the optimum choice.

Where reliability is critical and replacement of a failed part is not possible or practical, consider glass capacitors.

Where stability is essential, even in severe environments, consider glass capacitors.

Glass capacitors have experienced over four decades of usage in some of America's most demanding circuit applications. Among these are:

|          |                        |                   |
|----------|------------------------|-------------------|
| TDRSS    | Saturn IV              | Phalnx            |
| GOES     | Trident                | Standard Missile  |
| Cassini  | Space Shuttle          | Minuteman Missile |
| Mercury  | Galileo                | AWACS             |
| Gemini   | Matrix                 | Delta II          |
| Titan II | Hubble Space Telescope | MK-46 Torpedo     |

### OVER 4 DECADES OF MAJOR PROGRAM EXPERIENCE

#### RELIABILITY

AVX Glass capacitors are qualified to MIL-C-11272 and MIL-C-23269, failure rate levels M and S.

For the maximum in reliability, AVX makes the CYFR series, designed to Minuteman specifications. The CYFR series glass capacitors meet or exceed all requirements of AVX specifications J-950 and J-951, available on request.

The reasons for the high reliability of glass capacitors are straightforward.

- Simple construction — few things to go wrong.
- Glass dielectric — one of the most stable, inert materials available.
- Thorough inspection — every glass capacitor is individually inspected during production. This testing includes visual inspection, capacitance check, rated voltage check, and hermetic seal check (for glass case types).

AVX glass capacitors have been used in virtually all critical military and space programs for the past twenty-five years. Increasingly, they are also being used in non-military applications where failures can't be tolerated and circuit performance is critical.

#### STABILITY

Capacitor stability, or lack of it, is an inherent characteristic of the dielectric used. Few materials can match glass for stability, and few companies can match AVX Corporation for glass technology.

Glass doesn't corrode or degrade in any way. Glass is not subject to microfractures, delaminations, and other prob-

lems associated with certain crystalline materials. In addition, axial glass capacitors are hermetically encased in glass, with a true glass-to-metal seal at the leads. This construction is practically immune to severe environmental effects such as shock, vibration, radiation resistance, moisture, salt spray, and solder heat.

#### RADIATION RESISTANCE

The unique materials and construction techniques involved with glass capacitors make them ideal for use in radiation environments. After a total dose of nearly  $10^8$  rads ( $H_2O$ ) glass capacitors exhibit only a minor change in capacitance. ( $\leq 5\%$ ) and an 8% change in dissipation factor. Furthermore, glass capacitors can operate in fast neutron flux environments of  $1 \times 10^{16} \text{cm}^{-2} \text{sec}^{-1}$  and experience little or no damage in component parameters.

#### PREDICTABILITY

The dielectric is formed as a continuous ribbon of glass. Physical and electrical properties and dimensions are precisely controlled.

This results in every AVX glass capacitor being just like every other, part-to-part, and lot-to-lot. Couple this built-in predictability with complete performance specifications and you know what performance to expect before the first prototype is built.

#### CONSTRUCTION

Simplicity is the key to reliable construction. There are only three materials in axial glass capacitors: glass dielectric and case, aluminum foil electrodes, and wire leads. (Radial capacitors have a molded case.)

The leads are welded to the electrodes so there are no pressure connections to come loose and no solder connections to melt.

#### PERFORMANCE

Quality control and simplicity of design mean that AVX glass capacitors are close to being a "perfect circuit symbol capacitance." Here is what you get with AVX glass capacitors:

- Nuclear Radiation Resistance
- Zero Aging Rate
- High Q Factor
- Large RF Current Capability
- No Piezoelectric Noise
- Low Dielectric Absorption
- $\pm 5 \text{ppm}$  Temperature Coefficient Retraceability
- High Breakdown Voltage
- Zero Voltage Coefficient

Specific electrical performance details are given in the AVX Glass and Glass-K Designers' Handbook.

The following glass capacitors are described in this brochure:

Qualified to MIL-C-11272, standard military specification, and used in industrial applications:

CY10, CY15 — Axial Leads

CY06, CY07, CY08 — Radial Leads

Qualified to MIL-C-23269, established reliability specifica-

# Glass Capacitors

## Introduction



tion, used primarily in military applications:

CYR10, CYR15 — Axial Leads

CYR51, CYR52, CYR53 — Radial Leads

AVX also makes the CYFR series, ultra-high reliability types designed to Minuteman specifications.

Elevated temperature glass capacitors with a working temperature of  $-75^{\circ}\text{C}$  to  $+200^{\circ}\text{C}$ :

ET10, ET15 — Axial Leads

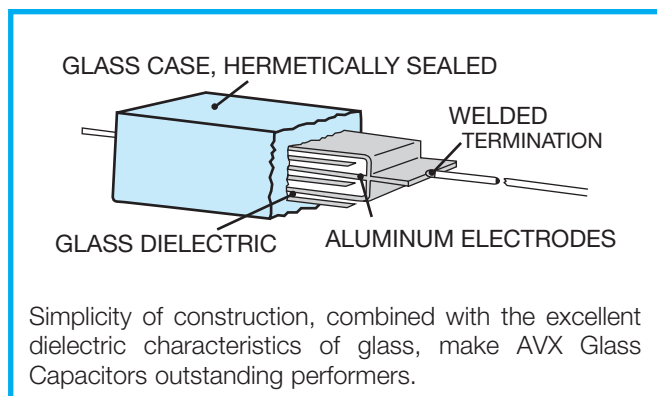
ET06, ET07, ET08 — Radial Leads

High reliability elevated temperature glass capacitors:

ETR10, ETR15 — Axial Leads

ETR06, ETR07, ETR08 — Radial Leads

Although all AVX glass capacitors are of similar construction, performance characteristics vary slightly between axial and radial types due to differences in form factor and lead configuration. The performance descriptions and curves that follow are identified as applying to axial or radial types or both.



**Temperature Coefficient:** The actual temperature coefficient for glass capacitors is shown in Figure 1. It is a slightly nonlinear curve varying from  $+115\text{ppm}/^{\circ}\text{C}$  at  $-55^{\circ}\text{C}$  to  $+165\text{ppm}/^{\circ}\text{C}$  at  $+125^{\circ}\text{C}$ . Temperature coefficient can be accurately represented by the linear approximation  $140 \pm 25\text{ppm}/^{\circ}\text{C}$ .

Temperature coefficient is not affected by DC bias voltage nor by measurement frequency over the range of 1kHz to 1MHz. There is no hysteresis in the T.C. curve and part-to-part and lot-to-lot variations are no greater than  $\pm 5\text{ppm}$ .

Capacitance drift over the temperature range  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$  is no greater than 0.1% or 0.1pF, whichever is larger.

**Capacitance Change vs. Temperature:** Derived from the T.C. curve,  $\Delta C$  vs. temperature is shown in Figure 2 for both axials and radials.

**Losses vs. Temperature:** Maximum dissipation factor (DF) is 0.1% at 0.1kHz and  $25^{\circ}\text{C}$ . The variation of DF vs. temperature is shown in Figure 3 for radials and Figure 4 for axials. There is no significant variation in DF or Q with different capacitance values when measured at 1.0kHz. See losses vs. capacitance, below, for variations with capacitance value when measured at 1.0MHz.

**Insulation Resistance vs. Temperature:** Insulation resist-

ance is greater than 100,000 megohms at  $25^{\circ}\text{C}$  (500,000 megohms for the CYFR series). At  $125^{\circ}\text{C}$ , insulation resistance is greater than 10,000 megohms.

**Capacitance Change vs. Frequency:** Capacitance change vs. frequency is typically less than one percent up to 1MHz. See Figure 5.

**Losses vs. Frequency:** Dissipation factor at 1.0kHz and  $25^{\circ}\text{C}$  is 0.1% maximum for all axials and for radials greater than 100pF. DF is 0.2% for radials 100pF and below. The variation of DF and its reciprocal Q vs. frequency is shown in Figure 6 for radials and Figure 7 for axials. There is no significant variation in DF or Q with capacitance value when measured at 1.0kHz. See below for losses vs. capacitance value when measured at 1.0MHz.

**Losses vs. Capacitance Value:** The variation of Q with capacitance value when measured at 1.0MHz is shown in Figure 8 for radials and Figure 9 for axials.

**Resonant Frequency vs. Capacitance Value:** The frequency at which the capacitor becomes self-resonant is a function of both capacitance value and lead length. Typical curves are given in Figure 10 and radials and Figure 11 for axials.

**Voltage Coefficient:** Voltage coefficient is zero. There is no measurable change in capacitance from 0 to full working voltage. Voltage coefficient remains zero over the full temperature range and at all useful frequencies.

**Surge Voltage:** CYR types are tested in accordance with MIL-C-23269 and withstand a surge voltage of  $1500 \pm 30$  VDC.

**Temperature Range:** The operating temperature range for all glass capacitors is  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$  with no voltage derating required. Elevated Temperature (ET) capacitor operating temperature range  $-75^{\circ}\text{C}$  to  $+200^{\circ}\text{C}$  (with overexposure to  $+250^{\circ}\text{C} \leq 1$  hour (axial) with no performance degradation).

**Moisture Resistance:** Meets or exceeds all requirements of MIL-C-11272 or MIL-C-23269, as applicable.

**Life:** When tested under accelerated conditions of  $125^{\circ}\text{C}$  with 150% of rated voltage applied for 2,000 hours, glass capacitors meet the requirements listed below. Pre- and post-test measurements are at  $25^{\circ}\text{C}$ .

Capacitance Change — Less than 0.5% or 0.5pF, whichever is greater, for all glass capacitors.

Dissipation Factor —

CY10, 15 — 0.20% maximum

CY06, 07, 08 — 0.25% maximum for values above 100pF, 0.45% maximum for 100pF and below

CYR10, 15 — 0.15% maximum

CYR51, 52, 53 — 0.25% maximum for values above 100pF, 0.45% for 100pF and below

CYR10, 15 — 0.15% maximum

**Insulation Resistance:** Greater than 100,000 megohms (500,000 megohms for CYFR series).

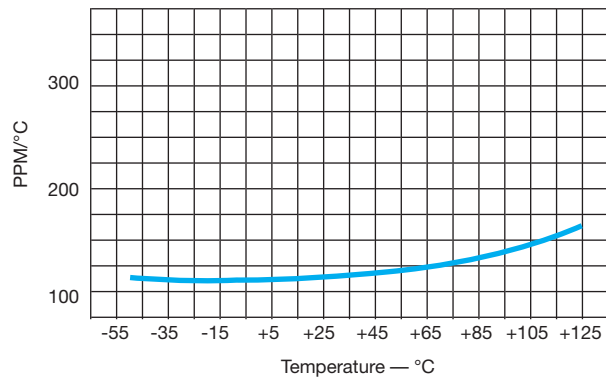
**Noise:** Glass dielectric capacitors have zero piezoelectric noise due to their unique dielectric material construction.

# Glass Capacitors

## Performance Curves

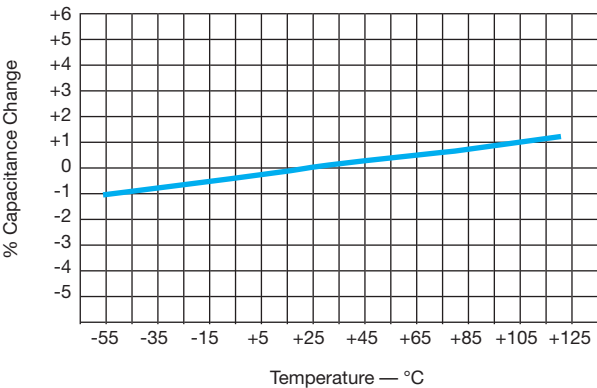


**FIGURE 1**



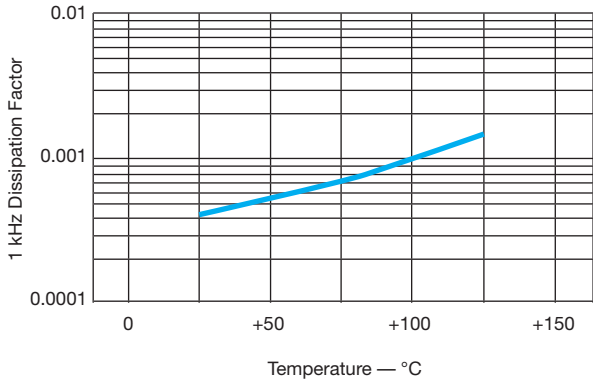
**Temperature Coefficient vs. Temperature  
Radial and Axial**

**FIGURE 2**



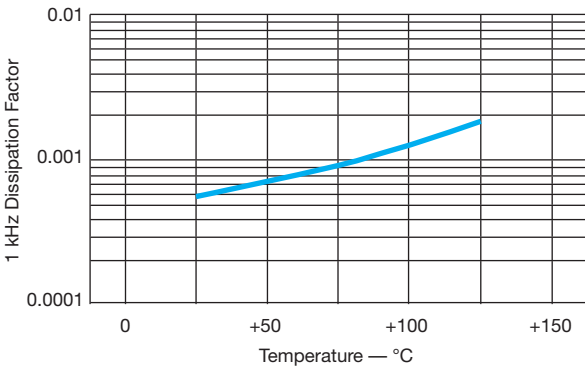
**% Capacitance Change vs. Temperature  
Radial and Axial**

**FIGURE 3**



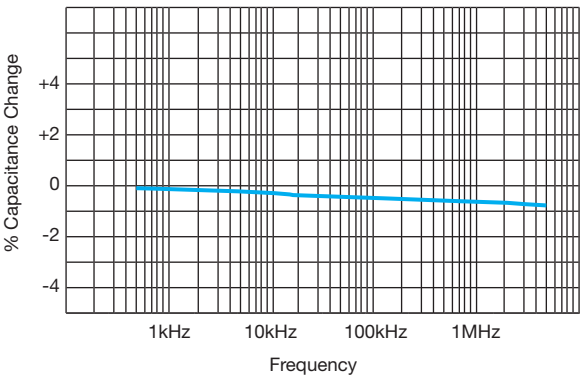
**Dissipation Factor vs. Temperature  
Radial**

**FIGURE 4**



**Dissipation Factor vs. Temperature  
Axial**

**FIGURE 5**



**% Capacitance Change vs. Frequency  
Radial and Axial**

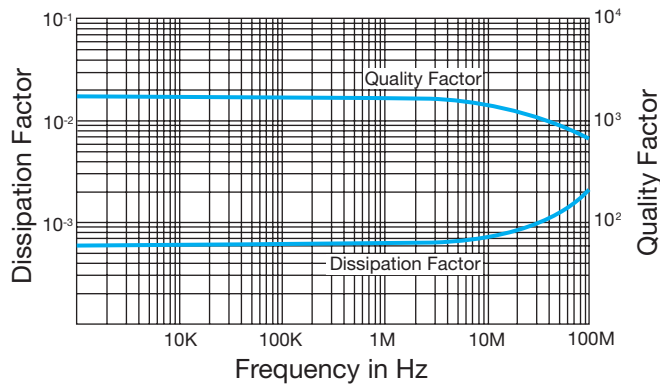


# Glass Capacitors

## Performance Curves

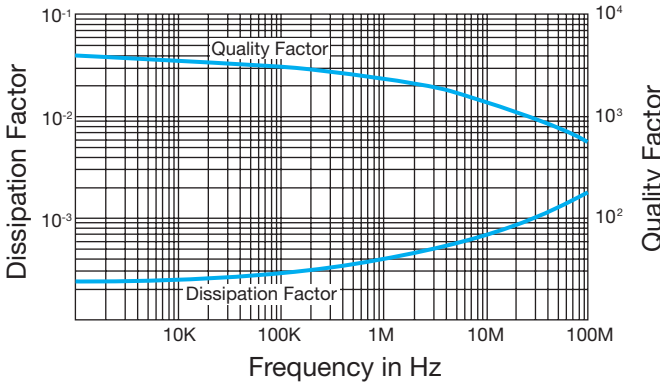


**FIGURE 6**



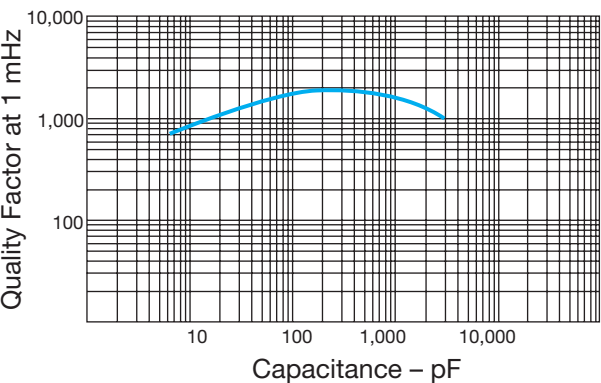
**Quality Factor and Dissipation Factor  
vs. Frequency  
Radial**

**FIGURE 7**



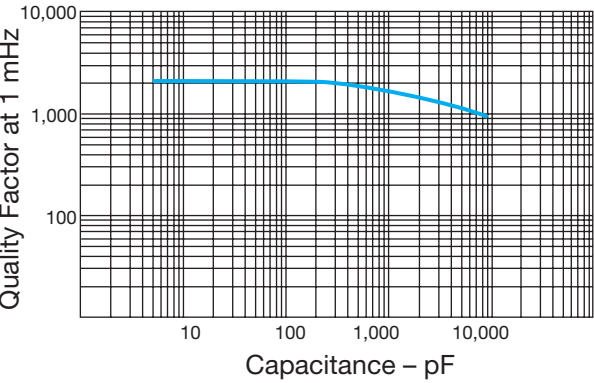
**Quality Factor and Dissipation Factor  
vs. Frequency  
Axial**

**FIGURE 8**



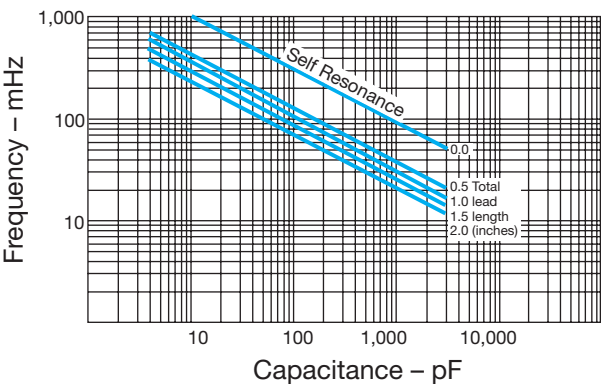
**Quality Factor vs. Capacitance  
Radial**

**FIGURE 9**



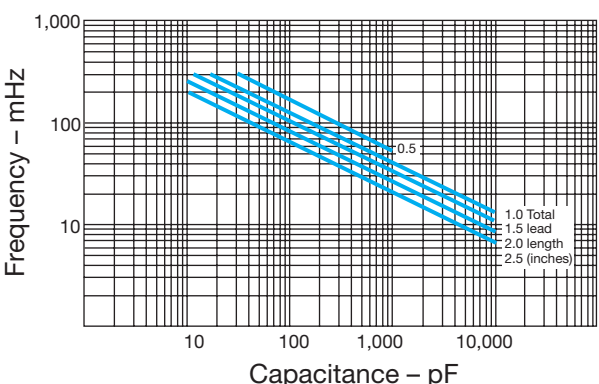
**Quality Factor vs. Capacitance  
Axial**

**FIGURE 10**



**Resonant Frequency vs. Capacitance  
Radial**

**FIGURE 11**



**Resonant Frequency vs. Capacitance  
Axial**



# Glass Capacitors

## CY10, 15 (QPL to MIL-C-11272/01/02/03/04)



### APPLICATIONS

These extremely stable glass capacitors, AVX style CY, meet or exceed all requirements of MIL-C-11272. With glass dielectric, fused monolithic construction, and true glass-to-metal seals at the leads, they have very low losses and are virtually immune to severe environmental stresses.

### PERFORMANCE CHARACTERISTICS

**Tolerance:** Available tolerances for each value of capacitance are shown in the ordering information table. For codes, refer to the Part Numbers paragraph.

**Temperature Coefficient:** +140  $\pm$ 25 ppm/ $^{\circ}$ C at 100kHz. TC will track and retrace to within  $\pm$ 5 ppm. Capacitance drift is less than 0.1% or 0.1pF, whichever is greater.

**Voltage Coefficient:** Zero.

**Losses:** Extremely low, and remain relatively low at elevated temperatures. Dissipation factor is not more than 0.001 at 1.0kHz and 25 $^{\circ}$ C.

**Life:** After 2,000 hours at 125 $^{\circ}$ C with 150% of rated voltage applied, capacitance change is less than 0.5% or 0.5pF, whichever is greater.

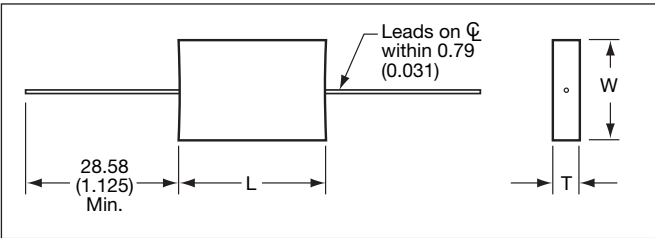
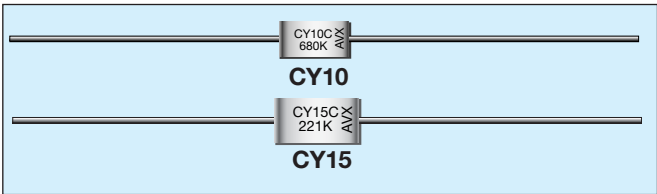
**Insulation Resistance:** Greater than 100,000 megohms at 25 $^{\circ}$ C; greater than 10,000 megohms at 125 $^{\circ}$ C.

**Voltage/Temperature Rating:** Voltage ratings are shown in the ordering information table. The operating temperature range is -55 $^{\circ}$ C to +125 $^{\circ}$ C with no derating required.

**Moisture Resistance:** Meets or exceeds all requirements of MIL-C-11272 and MIL-STD-202, Method 106.

**Radiation Resistance:** The unique materials and construction techniques involved with glass capacitors make them ideal for use in radiation environments. After a total dose of nearly  $10^8$  rads ( $H_2O$ ) glass capacitors exhibit only a minor change in capacitance ( $\leq$ 5%) and an 8% change in dissipation factor. Furthermore, glass capacitors can operate in fast neutron flux environments of  $10^{15}$  N cm $^{-2}$ sec $^{-1}$  and experience little or no damage in component parameters.

Additional performance details are given in the AVX "Performance Characteristics of Multilayer Glass Dielectric Capacitors" technical paper.X



### DIMENSIONS:

millimeters (inches)

| Case Size | L                                       | W                                     | T                                      | Lead Dia.<br>+0.1 (+0.004)<br>-0.03 (-0.001) | Weight<br>(Grams) |
|-----------|-----------------------------------------|---------------------------------------|----------------------------------------|----------------------------------------------|-------------------|
| CY10      | 8.74 $\pm$ 1.19<br>(0.344 $\pm$ 0.047)  | 4.37 $\pm$ .79<br>(0.172 $\pm$ 0.031) | 1.98 $\pm$ .79<br>(0.078 $\pm$ 0.031)  | .51<br>(0.020)                               | .25 - .50         |
| CY15      | 11.91 $\pm$ 1.19<br>(0.469 $\pm$ 0.047) | 6.76 $\pm$ .79<br>(0.266 $\pm$ 0.031) | 2.77 $\pm$ 1.19<br>(0.109 $\pm$ 0.047) | .51<br>(0.020)                               | .75 - 1.25        |

**Note:** Standard leads are solder-coated Dumet.

# Glass Capacitors

## Part Numbers and Ordering Information



### HOW TO ORDER

**CY**  
Style  
Glass Capacitor

**10**  
Case Size  
10  
15

**C**  
Operating  
Temperature Range  
-55°C to +125°C

**101**  
Capacitance Code  
Capacitance Code is expressed in picofarads (pF). The first two digits represent significant figures and the third digit specifies the number of zeros to follow; i.e. 101 indicates 100 pF. For values below 10 pF, R = decimal point; i.e. 1R5 indicates 1.5 pF.

**J**  
Capacitance Tolerance  
C = ±.25 pF  
D = ±.50 pF  
F = ±1%  
G = ±2%  
J = ±5%  
K = ±10%  
M = ±20%

### MARKING

|                                                                                                                                  |                                                                                                                                                       |
|----------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| <div style="border: 1px solid black; padding: 5px; display: inline-block;"> <b>CY10C</b><br/> <b>101J</b><br/> <b>AVX</b> </div> | CY = Glass Capacitor<br>10 = Case Size<br>C = Operating Temperature Range<br>101 = Capacitance, Coded in pF<br>J = Tolerance<br>AVX = AVX Corporation |
|----------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|

### RATINGS & PART NUMBER REFERENCE (Standard Values)

| Military Type Designation | Cap. (pF) | Tolerances Available | DC Working Voltage |
|---------------------------|-----------|----------------------|--------------------|
| <b>CY10</b>               |           |                      |                    |
| CY10C0R5                  | 0.5       | C                    | 500                |
| CY10C1R0                  | 1.0       | C, D                 | 500                |
| CY10C1R5                  | 1.5       | C, D                 | 500                |
| CY10C2R2                  | 2.2       | C, D                 | 500                |
| CY10C2R7                  | 2.7       | C, D                 | 500                |
| CY10C3R0                  | 3.0       | C, D                 | 500                |
| CY10C3R3                  | 3.3       | C, D                 | 500                |
| CY10C3R6                  | 3.6       | C, D                 | 500                |
| CY10C3R9                  | 3.9       | C, D                 | 500                |
| CY10C4R3                  | 4.3       | C, D                 | 500                |
| CY10C4R7                  | 4.7       | C, K                 | 500                |
| CY10C5R1                  | 5.1       | C, J, K              | 500                |
| CY10C5R6                  | 5.6       | C, J, K              | 500                |
| CY10C6R2                  | 6.2       | C, J, K              | 500                |
| CY10C6R8                  | 6.8       | C, J, K              | 500                |
| CY10C7R5                  | 7.5       | C, J, K              | 500                |
| CY10C8R2                  | 8.2       | C, J, K              | 500                |
| CY10C9R1                  | 9.1       | C, J, K              | 500                |
| CY10C100                  | 10        | C, J, K, M           | 500                |
| CY10C110                  | 11        | C, J, K, M           | 500                |
| CY10C120                  | 12        | C, J, K, M           | 500                |
| CY10C130                  | 13        | C, G, J, K, M        | 500                |
| CY10C150                  | 15        | C, G, J, K, M        | 500                |
| CY10C160                  | 16        | C, G, J, K, M        | 500                |
| CY10C180                  | 18        | C, G, J, K, M        | 500                |
| CY10C200                  | 20        | C, G, J, K, M        | 500                |
| CY10C220                  | 22        | C, G, J, K, M        | 500                |
| CY10C240                  | 24        | C, G, J, K, M        | 500                |
| CY10C270                  | 27        | F, G, J, K, M        | 500                |
| CY10C300                  | 30        | F, G, J, K, M        | 500                |
| CY10C330                  | 33        | F, G, J, K, M        | 500                |
| CY10C360                  | 36        | F, G, J, K, M        | 500                |
| CY10C390                  | 39        | F, G, J, K, M        | 500                |
| CY10C430                  | 43        | F, G, J, K, M        | 500                |
| CY10C470                  | 47        | F, G, J, K, M        | 500                |
| CY10C510                  | 51        | F, G, J, K, M        | 500                |
| CY10C560                  | 56        | F, G, J, K, M        | 500                |
| CY10C620                  | 62        | F, G, J, K, M        | 500                |
| CY10C680                  | 68        | F, G, J, K, M        | 500                |
| CY10C750                  | 75        | F, G, J, K, M        | 500                |
| CY10C820                  | 82        | F, G, J, K, M        | 500                |
| CY10C910                  | 91        | F, G, J, K, M        | 500                |
| CY10C101                  | 100       | F, G, J, K, M        | 500                |
| CY10C111                  | 110       | F, G, J, K, M        | 500                |
| CY10C121                  | 120       | F, G, J, K, M        | 500                |
| CY10C131                  | 130       | F, G, J, K, M        | 500                |
| CY10C151                  | 150       | F, G, J, K, M        | 500                |
| CY10C161                  | 160       | F, G, J, K, M        | 500                |
| CY10C181                  | 180       | F, G, J, K, M        | 500                |
| CY10C201                  | 200       | F, G, J, K, M        | 500                |
| CY10C221                  | 220       | F, G, J, K, M        | 300                |
| CY10C241                  | 240       | F, G, J, K, M        | 300                |
| CY10C271                  | 270       | F, G, J, K, M        | 300                |
| CY10C301                  | 300       | F, G, J, K, M        | 300                |

—Add letter for tolerance code above lines.

| Military Type Designation | Cap. (pF) | Tolerances Available | DC Working Voltage |
|---------------------------|-----------|----------------------|--------------------|
| <b>CY15</b>               |           |                      |                    |
| CY15C221                  | 220       | F, G, J, K, M        | 500                |
| CY15C241                  | 240       | F, G, J, K, M        | 500                |
| CY15C271                  | 270       | F, G, J, K, M        | 500                |
| CY15C301                  | 300       | F, G, J, K, M        | 500                |
| CY15C331                  | 330       | F, G, J, K, M        | 500                |
| CY15C361                  | 360       | F, G, J, K, M        | 500                |
| CY15C391                  | 390       | F, G, J, K, M        | 500                |
| CY15C431                  | 430       | F, G, J, K, M        | 500                |
| CY15C471                  | 470       | F, G, J, K, M        | 500                |
| CY15C511                  | 510       | F, G, J, K, M        | 500                |
| CY15C561                  | 560       | F, G, J, K, M        | 300                |
| CY15C621                  | 620       | F, G, J, K, M        | 300                |
| CY15C681                  | 680       | F, G, J, K, M        | 300                |
| CY15C751                  | 750       | F, G, J, K, M        | 300                |
| CY15C821                  | 820       | F, G, J, K, M        | 300                |
| CY15C911                  | 910       | F, G, J, K, M        | 300                |
| CY15C102                  | 1,000     | F, G, J, K, M        | 300                |
| CY15C112                  | 1,100     | F, G, J, K, M        | 300                |
| CY15C122                  | 1,200     | F, G, J, K, M        | 300                |

—Add letter for tolerance code above lines.



# Glass Capacitors

## CY06, 07, 08 (QPL to MIL-C-11272/13/14/15)



### APPLICATIONS

These precision miniature glass capacitors, AVX style CY0, meet or exceed all requirements of MIL-C-11272. Constructed of a fused monolithic capacitive element in a rectangular case with gold-plated radial Dumet leads, this series permits high packaging efficiency for printed circuit applications where extremely stable, low-loss capacitors are required.

### PERFORMANCE CHARACTERISTICS

**Tolerance:** Available tolerances for each value of capacitance are shown in the ordering information table. For codes, refer to the Part Numbers paragraph.

**Temperature Coefficient:**  $+140 \pm 25$  ppm/ $^{\circ}\text{C}$  at 100kHz. TC will track and retrace to within  $\pm 5$  ppm. Capacitance drift is less than 0.1% or 0.1pF, whichever is greater.

**Voltage Coefficient:** Zero.

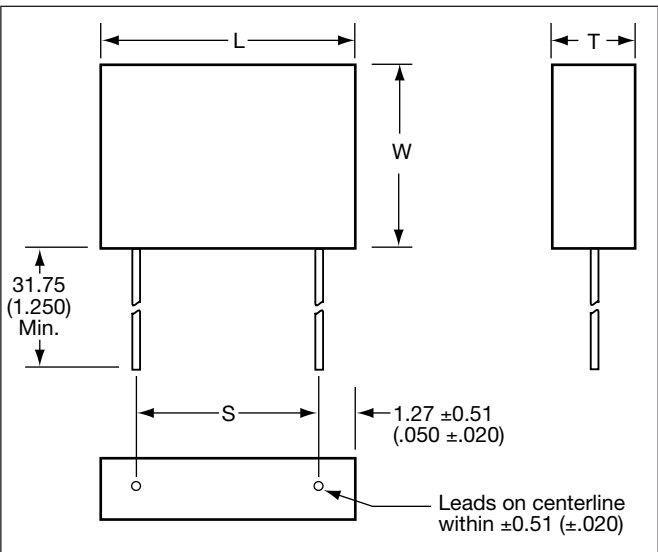
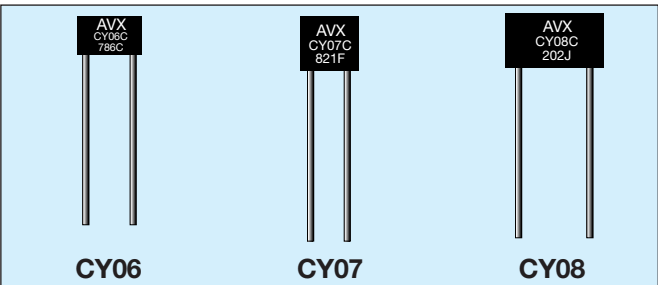
**Losses:** Extremely low, and remain relatively low at elevated temperatures. Dissipation factor at 1kHz and  $25^{\circ}\text{C}$  is less than 0.001 for values greater than 100pF and less than 0.002 for values of 100pF and below.

**Life:** After 2,000 hours at  $125^{\circ}\text{C}$  with 150% of rated voltage applied, capacitance change is less than 0.5% or 0.5 pF; dissipation factor is less than 0.0025 for values above 100 pF and less than 0.0045 for values of 100 pF and below.

**Insulation Resistance:** Greater than 100,000 megohms at  $25^{\circ}\text{C}$ ; greater than 10,000 megohms at  $125^{\circ}\text{C}$ .

**Voltage/Temperature Rating:** 300 WVDC over the temperature range of  $-55^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$  with no derating required.

Additional performance details are given in the AVX "Performance Characteristics of Multilayer Glass Dielectric Capacitors" technical paper.



### DIMENSIONS:

millimeters (inches)

| Case Size | L<br>$\pm 0.13$<br>( $\pm 0.005$ ) | W<br>$\pm 0.25$<br>( $\pm 0.010$ ) | T<br>$\pm 0.13$<br>( $\pm 0.005$ ) | S<br>$\pm 0.51$<br>( $\pm 0.020$ ) | Weight<br>(Grams) |
|-----------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|-------------------|
| CY06      | 7.62<br>(0.300)                    | 5.08<br>(0.200)                    | 2.92<br>(0.115)                    | 5.08<br>(0.200)                    | .3 - .4           |
| CY07      | 7.62<br>(0.300)                    | 7.62<br>(0.300)                    | 2.92<br>(0.115)                    | 5.08<br>(0.200)                    | .4 - .5           |
| CY08      | 12.70<br>(0.500)                   | 7.62<br>(0.300)                    | 2.92<br>(0.115)                    | 10.16<br>(0.400)                   | .7 - .8           |

**Note:** All leads are 24 AWG,  $0.51 \pm .05$  ( $0.020 \pm 0.002$ ) diameter. Leads are solderable and weldable gold-plated Dumet, per MIL-STD-1276, Type D.

# Glass Capacitors

## Part Numbers and Ordering Information



### HOW TO ORDER

**CY**  
|  
**Style**  
Glass Capacitor

**06**  
|  
**Case Size**  
06  
07  
08

**C**  
|  
**Operating Temperature Range**  
-55°C to +125°C

**561**  
|  
**Capacitance Code**  
Capacitance Code is expressed in picofarads (pF). The first two digits represent significant figures and the third digit specifies the number of zeros to follow; i.e. 561 indicates 560 pF. For values below 10 pF, R = decimal point; i.e. 1R5 indicates 1.5 pF.

**J**  
|  
**Capacitance Tolerance**  
C = ±.25 pF  
D = ±.50 pF  
F = ±1%  
G = ±2%  
J = ±5%  
K = ±10%  
M = ±20%

### MARKING

|                                                 |                                                                                                                                                       |
|-------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| <div>AVX</div> <div>CY06C</div> <div>561J</div> | AVX = AVX Corporation<br>CY = Glass Capacitor<br>06 = Case Size<br>C = Operating Temperature Range<br>561 = Capacitance, Coded in pF<br>J = Tolerance |
|-------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|

### RATINGS & PART NUMBER REFERENCE (Standard Values)

| Military Type Designation | Capacitance (pF) | Tolerances Available | DC Working Voltage |
|---------------------------|------------------|----------------------|--------------------|
| <b>CY06</b>               |                  |                      |                    |
| CY06C1R0_                 | 1.0              | C, D                 | 300                |
| CY06C1R5_                 | 1.5              | C, D                 | 300                |
| CY06C2R2_                 | 2.2              | C, D                 | 300                |
| CY06C2R7_                 | 2.7              | C, D                 | 300                |
| CY06C3R0_                 | 3.0              | C, D                 | 300                |
| CY06C3R3_                 | 3.3              | C, D                 | 300                |
| CY06C3R6_                 | 3.6              | C, D                 | 300                |
| CY06C3R9_                 | 3.9              | C, D                 | 300                |
| CY06C4R3_                 | 4.3              | C, D                 | 300                |
| CY06C4R7_                 | 4.7              | C, K                 | 300                |
| CY06C5R1_                 | 5.1              | C, J, K              | 300                |
| CY06C5R6_                 | 5.6              | C, J, K              | 300                |
| CY06C6R2_                 | 6.2              | C, J, K              | 300                |
| CY06C6R8_                 | 6.8              | C, J, K              | 300                |
| CY06C7R5_                 | 7.5              | C, J, K              | 300                |
| CY06C8R2_                 | 8.2              | C, J, K              | 300                |
| CY06C9R1_                 | 9.1              | C, J, K              | 300                |
| CY06C100_                 | 10               | C, J, K, M           | 300                |
| CY06C110_                 | 11               | C, J, K, M           | 300                |
| CY06C120_                 | 12               | C, J, K, M           | 300                |
| CY06C130_                 | 13               | C, G, J, K, M        | 300                |
| CY06C150_                 | 15               | C, G, J, K, M        | 300                |
| CY06C160_                 | 16               | C, G, J, K, M        | 300                |
| CY06C180_                 | 18               | C, G, J, K, M        | 300                |
| CY06C200_                 | 20               | C, G, J, K, M        | 300                |
| CY06C220_                 | 22               | C, G, J, K, M        | 300                |
| CY06C240_                 | 24               | C, G, J, K, M        | 300                |
| CY06C270_                 | 27               | F, G, J, K, M        | 300                |
| CY06C300_                 | 30               | F, G, J, K, M        | 300                |
| CY06C330_                 | 33               | F, G, J, K, M        | 300                |
| CY06C360_                 | 36               | F, G, J, K, M        | 300                |
| CY06C390_                 | 39               | F, G, J, K, M        | 300                |
| CY06C430_                 | 43               | F, G, J, K, M        | 300                |
| CY06C470_                 | 47               | F, G, J, K, M        | 300                |
| CY06C510_                 | 51               | F, G, J, K, M        | 300                |
| CY06C560_                 | 56               | F, G, J, K, M        | 300                |
| CY06C620_                 | 62               | F, G, J, K, M        | 300                |
| CY06C680_                 | 68               | F, G, J, K, M        | 300                |
| CY06C750_                 | 75               | F, G, J, K, M        | 300                |
| CY06C820_                 | 82               | F, G, J, K, M        | 300                |

— Add letter for tolerance code above lines.

| Military Type Designation | Capacitance (pF) | Tolerances Available | DC Working Voltage |
|---------------------------|------------------|----------------------|--------------------|
| <b>CY06 (cont)</b>        |                  |                      |                    |
| CY06C910_                 | 91               | F, G, J, K, M        | 300                |
| CY06C101_                 | 100              | F, G, J, K, M        | 300                |
| CY06C111_                 | 110              | F, G, J, K, M        | 300                |
| CY06C121_                 | 120              | F, G, J, K, M        | 300                |
| CY06C131_                 | 130              | F, G, J, K, M        | 300                |
| CY06C151_                 | 150              | F, G, J, K, M        | 300                |
| CY06C161_                 | 160              | F, G, J, K, M        | 300                |
| CY06C181_                 | 180              | F, G, J, K, M        | 300                |
| CY06C201_                 | 200              | F, G, J, K, M        | 300                |
| CY06C221_                 | 220              | F, G, J, K, M        | 300                |
| CY06C241_                 | 240              | F, G, J, K, M        | 300                |
| CY06C271_                 | 270              | F, G, J, K, M        | 300                |
| CY06C301_                 | 300              | F, G, J, K, M        | 300                |
| CY06C331_                 | 330              | F, G, J, K, M        | 300                |
| CY06C361_                 | 360              | F, G, J, K, M        | 300                |
| CY06C391_                 | 390              | F, G, J, K, M        | 300                |
| CY06C431_                 | 430              | F, G, J, K, M        | 300                |
| CY06C471_                 | 470              | F, G, J, K, M        | 300                |
| CY06C511_                 | 510              | F, G, J, K, M        | 300                |
| CY06C561_                 | 560              | F, G, J, K, M        | 300                |
| <b>CY07</b>               |                  |                      |                    |
| CY07C621_                 | 620              | F, G, J, K, M        | 300                |
| CY07C681_                 | 680              | F, G, J, K, M        | 300                |
| CY07C751_                 | 750              | F, G, J, K, M        | 300                |
| CY07C821_                 | 820              | F, G, J, K, M        | 300                |
| CY07C911_                 | 910              | F, G, J, K, M        | 300                |
| CY07C102_                 | 1,000            | F, G, J, K, M        | 300                |
| <b>CY08</b>               |                  |                      |                    |
| CY08C112_                 | 1,100            | F, G, J, K, M        | 300                |
| CY08C122_                 | 1,200            | F, G, J, K, M        | 300                |
| CY08C132_                 | 1,300            | F, G, J, K, M        | 300                |
| CY08C152_                 | 1,500            | F, G, J, K, M        | 300                |
| CY08C162_                 | 1,600            | F, G, J, K, M        | 300                |
| CY08C182_                 | 1,800            | F, G, J, K, M        | 300                |
| CY08C202_                 | 2,000            | F, G, J, K, M        | 300                |
| CY08C222_                 | 2,200            | F, G, J, K, M        | 300                |
| CY08C242_                 | 2,400            | F, G, J, K, M        | 300                |

— Add letter for tolerance code above lines.

# Glass Capacitors

## CYFR10, 15, 20, 30 (High Reliability)



### APPLICATIONS

AVX Style CYFR high reliability glass capacitors have failure rates among the lowest available. Outstanding stability, reliability and electrical performance are provided by the fused monolithic construction, which is virtually immune to environmental stresses. These capacitors meet or exceed all requirements of AVX specifications J-950 and J-951, which combine the most exciting features of many military specifications and substantially exceed most.

### PERFORMANCE CHARACTERISTICS

**Tolerance:** Available tolerances for each value of capacitance are shown in the Ordering Information table. For codes, refer to the Part Numbers paragraph.

**Temperature Coefficient:**  $+140 \pm 25$  ppm/ $^{\circ}\text{C}$  at 100kHz. TC will track and retrace to within  $\pm 5$  ppm. Capacitance drift is less than 0.1% or 0.1 pF, whichever is greater.

**Voltage Coefficient:** Zero.

**Losses:** Extremely low, and remain relatively low at elevated temperatures and high frequencies. Dissipation factor is less than 0.001 at 1kHz and  $25^{\circ}\text{C}$ .

**Life:** At 2,000 hours at  $125^{\circ}\text{C}$  with 150% of rated voltage applied, capacitance change is less than 0.5% or 0.5 pF, dissipation factor is less than 0.0015, and insulation resistance is greater than 500,000 megohms.

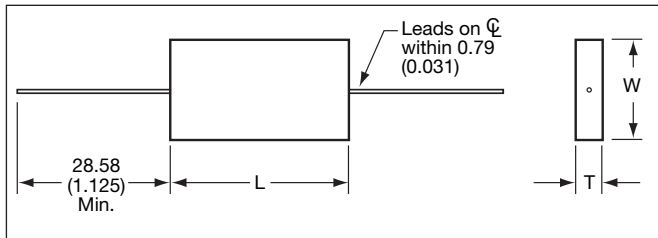
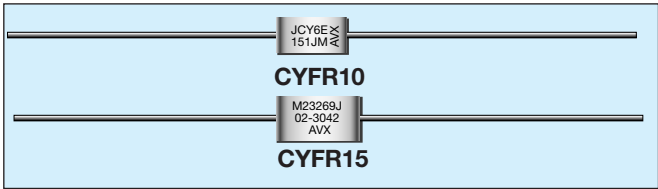
**Insulation Resistance:** Greater than 500,000 megohms at  $25^{\circ}\text{C}$ ; greater than 10,000 megohms at  $125^{\circ}\text{C}$ .

**Voltage/Temperature Rating:** Voltage ratings are shown in the ordering information table. The operating temperature range is  $-55^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$  with no derating required.

**Moisture Resistance:** Meets or exceeds all requirements of J-951 and MIL-STD-202, Method 106 for 50 cycles.

**Radiation Resistance:** The unique materials and construction techniques involved with glass capacitors make them ideal for use in radiation environments. After a total dose of nearly  $10^8$  rads ( $\text{H}_2\text{O}$ ) AVX glass capacitors exhibit only a minor change in capacitance ( $\leq 5\%$ ) and an 8% change in dissipation factor. Furthermore, glass capacitors can operate in fast neutron flux environments of  $10^{15}$  N  $\text{cm}^{-2}\text{sec}^{-1}$  and experience little or no damage in component parameters.

Additional performance details are given in the AVX "Performance Characteristics of Multilayer Glass Dielectric Capacitors" technical paper.



### DIMENSIONS:

millimeters (inches)

| Case Size | L                                         | W                                       | T                                        | Lead Dia.<br>$+0.1(+0.004)$<br>$-0.03(\pm 0.001)$ | Weight<br>(grams) |
|-----------|-------------------------------------------|-----------------------------------------|------------------------------------------|---------------------------------------------------|-------------------|
| CYFR10    | $8.74 \pm 1.19$<br>( $0.344 \pm 0.047$ )  | $4.37 \pm .79$<br>( $0.172 \pm 0.031$ ) | $1.98 \pm .79$<br>( $0.078 \pm 0.031$ )  | .51<br>(0.020)                                    | .25 - .50         |
| CYFR15    | $11.91 \pm 1.19$<br>( $0.469 \pm 0.047$ ) | $6.76 \pm .79$<br>( $0.266 \pm 0.031$ ) | $2.77 \pm 1.19$<br>( $0.109 \pm 0.047$ ) | .51<br>(0.020)                                    | .75 - 1.25        |

**Note:** Leads are solder-coated Dumet.

# Glass Capacitors

## Part Numbers and Ordering Information



### HOW TO ORDER

**CYFR**

**Style**  
High Reliability  
Glass Capacitor

**10**

**Case Size**  
10  
15  
20  
30

**S**

**Lead Finish**  
3 = Solder Coated  
Dumet

**101**

**Capacitance Code**  
Capacitance Code is expressed in picofarads (pF). The first two digits represent significant figures and the third digit specifies the number of zeros to follow; i.e. 101 indicates 100 pF. For values below 10 pF, R = decimal point; i.e. 1R5 indicates 1.5 pF.

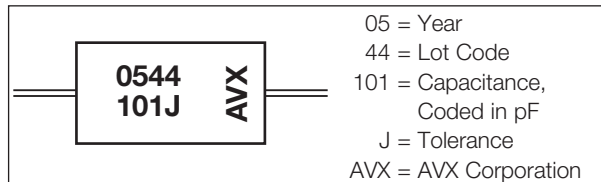
**J**

**Capacitance Tolerance**  
C =  $\pm 0.25$  pF  
D =  $\pm 0.50$  pF  
F =  $\pm 1\%$   
G =  $\pm 2\%$   
J =  $\pm 5\%$

**A**

**Test Level**  
A = J-950 Specification  
No designator = J-951 Specification

### MARKING



### RATINGS & PART NUMBER REFERENCE (Standard Values)

| AVX Part Number | Capacitance (pF) | Tolerances Available | DC Working Voltage |
|-----------------|------------------|----------------------|--------------------|
| <b>CYFR10</b>   |                  |                      |                    |
| CYFR10S0R5_     | 0.5              | C                    | 500                |
| CYFR10S1R0_     | 1.0              | C                    | 500                |
| CYFR10S1R5_     | 1.5              | C                    | 500                |
| CYFR10S2R2_     | 2.2              | C, D                 | 500                |
| CYFR10S2R7_     | 2.7              | C                    | 500                |
| CYFR10S3R0_     | 3.0              | C, D                 | 500                |
| CYFR10S3R3_     | 3.3              | C                    | 500                |
| CYFR10S3R6_     | 3.6              | C, D                 | 500                |
| CYFR10S3R9_     | 3.9              | C                    | 500                |
| CYFR10S4R3_     | 4.3              | C                    | 500                |
| CYFR10S4R7_     | 4.7              | C                    | 500                |
| CYFR10S5R1_     | 5.1              | C                    | 500                |
| CYFR10S5R6_     | 5.6              | C                    | 500                |
| CYFR10S6R2_     | 6.2              | C, J                 | 500                |
| CYFR10S6R8_     | 6.8              | C, J                 | 500                |
| CYFR10S7R5_     | 7.5              | C, J                 | 500                |
| CYFR10S8R2_     | 8.2              | C, J                 | 500                |
| CYFR10S9R1_     | 9.1              | C, J                 | 500                |
| CYFR10S100_     | 10               | C, J                 | 500                |
| CYFR10S110_     | 11               | C, J                 | 500                |
| CYFR10S120_     | 12               | C, J                 | 500                |
| CYFR10S130_     | 13               | G, J                 | 500                |
| CYFR10S150_     | 15               | G, J                 | 500                |
| CYFR10S160_     | 16               | G, J                 | 500                |
| CYFR10S180_     | 18               | G, J                 | 500                |
| CYFR10S200_     | 20               | G, J                 | 500                |
| CYFR10S220_     | 22               | G, J                 | 500                |
| CYFR10S240_     | 24               | G, J                 | 500                |
| CYFR10S270_     | 27               | F, G, J              | 500                |
| CYFR10S300_     | 30               | F, G, J              | 500                |
| CYFR10S330_     | 33               | F, G, J              | 500                |
| CYFR10S360_     | 36               | F, G, J              | 500                |
| CYFR10S390_     | 39               | F, G, J              | 500                |
| CYFR10S430_     | 43               | F, G, J              | 500                |
| CYFR10S470_     | 47               | F, G, J              | 500                |
| CYFR10S510_     | 51               | F, G, J              | 500                |
| CYFR10S560_     | 56               | F, G, J              | 500                |
| CYFR10S620_     | 62               | F, G, J              | 500                |
| CYFR10S680_     | 68               | F, G, J              | 500                |
| CYFR10S750_     | 75               | F, G, J              | 500                |
| CYFR10S820_     | 82               | F, G, J              | 500                |
| CYFR10S910_     | 91               | F, G, J              | 500                |
| CYFR10S101_     | 100              | F, G, J              | 500                |
| CYFR10S111_     | 110              | F, G, J              | 500                |
| CYFR10S121_     | 120              | F, G, J              | 500                |
| CYFR10S131_     | 130              | F, G, J              | 500                |
| CYFR10S151_     | 150              | F, G, J              | 500                |
| CYFR10S161_     | 160              | F, G, J              | 300                |
| CYFR10S181_     | 180              | F, G, J              | 300                |
| CYFR10S201_     | 200              | F, G, J              | 300                |
| CYFR10S221_     | 220              | F, G, J              | 300                |
| CYFR10S241_     | 240              | F, G, J              | 300                |

— Add letter for tolerance code above lines.

| AVX Part Number | Capacitance (pF) | Tolerances Available | DC Working Voltage |
|-----------------|------------------|----------------------|--------------------|
| <b>CYFR15</b>   |                  |                      |                    |
| CYFR15S161_     | 160              | F, G, J              | 500                |
| CYFR15S181_     | 180              | F, G, J              | 500                |
| CYFR15S201_     | 200              | F, G, J              | 500                |
| CYFR15S221_     | 220              | F, G, J              | 500                |
| CYFR15S241_     | 240              | F, G, J              | 500                |
| CYFR15S271_     | 270              | F, G, J              | 500                |
| CYFR15S301_     | 300              | F, G, J              | 500                |
| CYFR15S331_     | 330              | F, G, J              | 500                |
| CYFR15S361_     | 360              | F, G, J              | 500                |
| CYFR15S391_     | 390              | F, G, J              | 500                |
| CYFR15S431_     | 430              | F, G, J              | 500                |
| CYFR15S471_     | 470              | F, G, J              | 500                |
| CYFR15S511_     | 510              | F, G, J              | 500                |
| CYFR15S561_     | 560              | F, G, J              | 300                |
| CYFR15S621_     | 620              | F, G, J              | 300                |
| CYFR15S681_     | 680              | F, G, J              | 300                |
| CYFR15S751_     | 750              | F, G, J              | 300                |
| CYFR15S821_     | 820              | F, G, J              | 300                |
| CYFR15S911_     | 910              | F, G, J              | 300                |
| CYFR15S102_     | 1000             | F, G, J              | 300                |
| CYFR15S112_     | 1100             | F, G, J              | 300                |
| CYFR15S122_     | 1200             | F, G, J              | 300                |

— Add letter for tolerance code above lines.



# Glass Capacitors

## CYR10, 15 (Established Reliability)

### M23269/01, 02, 03, 04 (QPL to MIL-C-23269)

#### FAILURE RATE LEVELS M AND S

#### APPLICATIONS

These precision glass dielectric capacitors are QPL to Established Reliability specification MIL-C-23269. Fused monolithic construction provides excellent electrical performance, environmental immunity, stability and retraceability. These capacitors have axial leads.

#### PERFORMANCE CHARACTERISTICS

**Temperature Coefficient:**  $+140 \pm 25$  ppm/ $^{\circ}\text{C}$  from  $-55^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$ . TC of all units will track and retrace to within  $\pm 5$  ppm.

**Life:** At rated conditions (100% rated voltage,  $125^{\circ}\text{C}$ ), capacitance change is less than:

- $\pm 0.5\%$  after 2,000 hours
- $\pm 2.0\%$  after 30,000 hours

At accelerated conditions (150% rated voltage,  $125^{\circ}\text{C}$ ), capacitance change is less than:

- $\pm 0.5\%$  after 2,000 hours
- $\pm 2.0\%$  after 6,000 hours

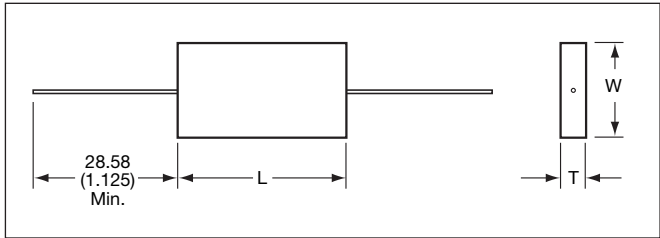
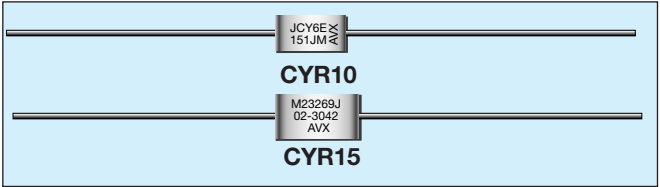
**Insulation Resistance:** A minimum of 100,000 megohms at  $25^{\circ}\text{C}$  and 10,000 megohms at  $125^{\circ}\text{C}$ .

**Voltage/Temperature Rating:** Voltage ratings are shown in the part number tables. The operating temperature range is  $-55^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$ .

**Radiation Resistance:** The unique materials and construction techniques involved with glass capacitors make them ideal for use in radiation environments. After a total dose of nearly  $10^8$  rads ( $\text{H}_2\text{O}$ ) glass capacitors exhibit only a minor change in capacitance ( $\leq 5\%$ ) and an 8% change in dissipation factor. Furthermore, glass capacitors can operate in fast neutron flux environments of  $10^{15}$  N  $\text{cm}^{-2}\text{sec}^{-1}$  and experience little or no damage in component parameters.

**Voltage Coefficient:** Zero.

Additional performance details are given in the AVX "Performance Characteristics of Multilayer Glass Dielectric Capacitors" technical paper.



#### DIMENSIONS:

millimeters (inches)

| Case Size | L                                         | W                                       | T                                        | Lead Dia.<br>$+0.1(+0.004)$<br>$-0.03(\pm 0.001)$ |
|-----------|-------------------------------------------|-----------------------------------------|------------------------------------------|---------------------------------------------------|
| CYR10     | $8.74 \pm 1.19$<br>( $0.344 \pm 0.047$ )  | $4.37 \pm .79$<br>( $0.172 \pm 0.031$ ) | $1.98 \pm .79$<br>( $0.078 \pm 0.031$ )  | .51<br>(0.020)                                    |
| CYR15     | $11.91 \pm 1.19$<br>( $0.469 \pm 0.047$ ) | $6.76 \pm .79$<br>( $0.266 \pm 0.031$ ) | $2.77 \pm 1.19$<br>( $0.109 \pm 0.047$ ) | .51<br>(0.020)                                    |

**Note:** Standard leads are solder-coated Dumet.

# Glass Capacitors

## Part Numbers and Ordering Information



### HOW TO ORDER

|                                                                                      |   |                                              |   |                                                                                                          |                                                                                                                        |
|--------------------------------------------------------------------------------------|---|----------------------------------------------|---|----------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|
| <b>M23269</b>                                                                        | / | <b>01</b>                                    | — | <b>3</b>                                                                                                 | <b>001</b>                                                                                                             |
| <b>Style</b><br>Military Specification<br>Established Reliability<br>Glass Capacitor |   | <b>Case Size</b><br>01 = CYR10<br>02 = CYR15 |   | <b>Failure Rate</b><br>3 = M level 1%/1000 hrs.<br>7 = S level .001%/1000 hrs.<br>(100 volt rating only) | <b>Capacitance Code</b><br>Capacitance value<br>coded in accordance<br>with MIL-C-23269 –<br>(see Part Number section) |

### MARKING

|                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>CYR10</b></p> <p><b>JCY5A</b><br/><b>0R5JM</b><br/><b>AVX</b></p> <p>J = JAN Trademark<br/>C = Capacitor<br/>Y = Glass Dielectric<br/>5 = Last digit of year<br/>A = 4 week lot code</p> <p>0R5 = Capacitance code –<br/>0R5 = 0.5pF<br/>J = Capacitance tolerance –<br/>J = ±5%, G = ±2%, F = ±1%<br/>M = Failure level<br/>AVX = AVX Corporation</p> | <p><b>CYR15</b></p> <p><b>M23269J</b><br/><b>02-3057</b><br/><b>AVX 05 B</b></p> <p>M23269 = Military specification<br/>established reliability<br/>glass capacitor<br/>J = JAN Trademark<br/>02 = Case size (CYR15)<br/>3 = Failure rate (M level)</p> <p>057 = Dash Number –<br/>(capacitance in pF and<br/>capacitance tolerance)<br/>AVX = AVX Corporation<br/>05 = Year<br/>B = Lot Code</p> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### RATINGS & PART NUMBER REFERENCE

| Cap. Value<br>(pF) | Part Number*<br>Capacitance Tolerance |       |       |
|--------------------|---------------------------------------|-------|-------|
| CYR10 M23269/01-   |                                       |       |       |
| 500 Volts**        | ±.25pF                                | ±.5pF | ±5%   |
| .5                 | * 001                                 | —     | —     |
| 1.0                | 002                                   | —     | —     |
| 1.5                | 003                                   | —     | —     |
| 2.2                | 004                                   | * 005 | —     |
| 2.7                | 006                                   | —     | —     |
| 3.0                | 007                                   | 008   | —     |
| 3.3                | 009                                   | —     | —     |
| 3.6                | 010                                   | 011   | —     |
| 3.9                | 012                                   | —     | —     |
| 4.3                | 013                                   | 014   | —     |
| 4.7                | 015                                   | —     | —     |
| 5.1                | 016                                   | —     | —     |
| 5.6                | 017                                   | —     | * 018 |
| 6.2                | 019                                   | —     | 020   |
| 6.8                | 021                                   | —     | 022   |
| 7.5                | 023                                   | —     | 024   |
| 8.2                | 025                                   | —     | 026   |
| 9.1                | 027                                   | —     | 028   |
| 10                 | 029                                   | —     | 030   |
| 11                 | 031                                   | —     | 032   |
| 12                 | 033                                   | —     | 034   |
|                    | ±1%                                   | ±2%   | ±5%   |
| 13                 | —                                     | * 035 | * 036 |
| 15                 | —                                     | 037   | 038   |
| 16                 | —                                     | 039   | 040   |
| 18                 | —                                     | 041   | 042   |
| 20                 | —                                     | 043   | 044   |
| 22                 | —                                     | 045   | 046   |
| 24                 | —                                     | 047   | 048   |
| 27                 | * 049                                 | 050   | 051   |
| 30                 | 052                                   | 053   | 054   |
| 33                 | 055                                   | 056   | 057   |
| 36                 | 058                                   | 059   | 060   |
| 39                 | 061                                   | 062   | 063   |
| 43                 | 064                                   | 065   | 066   |
| 47                 | 067                                   | 068   | 069   |
| 51                 | 070                                   | 071   | 072   |
| 56                 | 073                                   | 074   | 075   |
| 62                 | 076                                   | 077   | 078   |

\* Add first digit to indicate failure rate.  
\*\* S LEVEL = 100V rating for all values.

| Cap. Value<br>(pF)         | Part Number*<br>Capacitance Tolerance |       |       |
|----------------------------|---------------------------------------|-------|-------|
| CYR10 M23269/01- (cont'd.) |                                       |       |       |
| 500 Volts**                | ±1%                                   | ±2%   | ±5%   |
| 68                         | * 079                                 | * 080 | * 081 |
| 75                         | 082                                   | 083   | 084   |
| 82                         | 085                                   | 086   | 087   |
| 91                         | 088                                   | 089   | 090   |
| 100                        | 091                                   | 092   | 093   |
| 110                        | 094                                   | 095   | 096   |
| 120                        | 097                                   | 098   | 099   |
| 130                        | 100                                   | 101   | 102   |
| 150                        | 103                                   | 104   | 105   |
| 160                        | 106                                   | 107   | 108   |
| 180                        | 109                                   | 110   | 111   |
| 200                        | 112                                   | 113   | 114   |
| 300 Volts**                | ±1%                                   | ±2%   | ±5%   |
| 220                        | 115                                   | 116   | 117   |
| 240                        | 118                                   | 119   | 120   |
| 270                        | 121                                   | 122   | 123   |
| 300                        | 124                                   | 125   | 126   |
| CYR15 M23269/02-           |                                       |       |       |
| 500 Volts**                | ±1%                                   | ±2%   | ±5%   |
| 220                        | * 001                                 | * 002 | * 003 |
| 240                        | 004                                   | 005   | 006   |
| 270                        | 007                                   | 008   | 009   |
| 300                        | 010                                   | 011   | 012   |
| 330                        | 013                                   | 014   | 015   |
| 360                        | 016                                   | 017   | 018   |
| 390                        | 019                                   | 020   | 021   |
| 430                        | 022                                   | 023   | 024   |
| 470                        | 025                                   | 026   | 027   |
| 510                        | 028                                   | 029   | 030   |
| 300 Volts**                | ±1%                                   | ±2%   | ±5%   |
| 560                        | 031                                   | 032   | 033   |
| 620                        | 034                                   | 035   | 036   |
| 680                        | 037                                   | 038   | 039   |
| 750                        | 040                                   | 041   | 042   |
| 820                        | 043                                   | 044   | 045   |
| 910                        | 046                                   | 047   | 048   |
| 1,000                      | 049                                   | 050   | 051   |
| 1,100                      | 052                                   | 053   | 054   |
| 1,200                      | 055                                   | 056   | 057   |

\* Add first digit to indicate failure rate.  
\*\* S LEVEL = 100V rating for all values.



# Glass Capacitors

## CYR51, 52, 53 (Established Reliability)

### M23269/10 (QPL to MIL-C-23269)

#### FAILURE RATE LEVEL M

#### APPLICATIONS

These precision glass dielectric capacitors are QPL to Established Reliability specification MIL-C-23269. Fused monolithic construction provides excellent electrical performance, environmental immunity, stability and retraceability. These capacitors have radial leads.

#### PERFORMANCE CHARACTERISTICS

**Temperature Coefficient:**  $+140 \pm 25$  ppm/°C from -55°C to +125°C. TC of all units will track and retrace to within  $\pm 5$  ppm.

**Life:** At rated conditions (100% rated voltage, 125°C), capacitance change is less than:

- $\pm 0.5\%$  after 2,000 hours
- $\pm 2.0\%$  after 30,000 hours

At accelerated conditions (150% rated voltage, 125°C), capacitance change is less than:

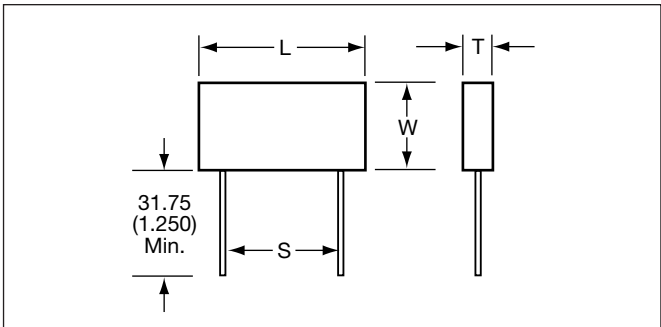
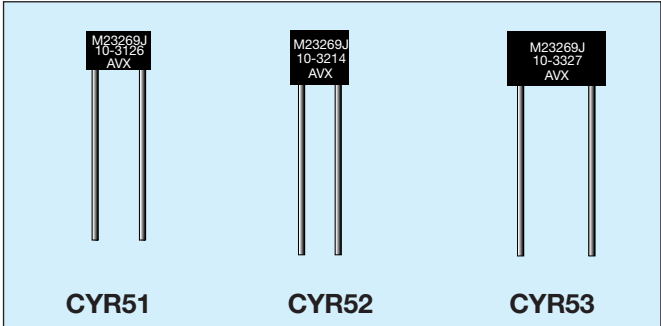
- $\pm 0.5\%$  after 2,000 hours
- $\pm 2.0\%$  after 6,000 hours

**Insulation Resistance:** A minimum of 100,000 megohms at 25°C and 10,000 megohms at 125°C.

**Voltage/Temperature Rating:** Voltage ratings are shown in the part number tables. The operating temperature range is -55°C to +125°C.

**Voltage Coefficient:** Zero

Additional performance details are given in the AVX "Performance Characteristics of Multilayer Glass Dielectric Capacitors" technical paper.



#### DIMENSIONS:

millimeters (inches)

| Case Size | L<br>$\pm 0.13$<br>( $\pm 0.005$ ) | W<br>$\pm 0.25$<br>( $\pm 0.010$ ) | T<br>$\pm 0.13$<br>( $\pm 0.005$ ) | S<br>$\pm 0.51$<br>( $\pm 0.020$ ) | Lead Dia.<br>$\pm 0.051$<br>( $\pm 0.002$ ) |
|-----------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|---------------------------------------------|
| CYR51     | 7.62<br>(0.300)                    | 5.08<br>(0.200)                    | 2.92<br>(0.115)                    | 5.08<br>(0.200)                    | .51<br>(0.020)                              |
| CYR52     | 7.62<br>(0.300)                    | 7.62<br>(0.300)                    | 2.92<br>(0.115)                    | 5.08<br>(0.200)                    | .51<br>(0.020)                              |
| CYR53     | 12.70<br>(0.500)                   | 7.62<br>(0.300)                    | 2.92<br>(0.115)                    | 10.16<br>(0.400)                   | .51<br>(0.020)                              |

**Note:** Leads are solderable and weldable gold-plated Dumet, per MIL-STD-1276, Type D.

# Glass Capacitors

## Part Numbers and Ordering Information



### HOW TO ORDER

|                                                                                      |   |                                                            |   |                                                  |                                                                                                                        |
|--------------------------------------------------------------------------------------|---|------------------------------------------------------------|---|--------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|
| <b>M23269</b>                                                                        | / | <b>10</b>                                                  | — | <b>3</b>                                         | <b>001</b>                                                                                                             |
| <b>Style</b><br>Military Specification<br>Established Reliability<br>Glass Capacitor |   | <b>Case Size</b><br>Slash sheet<br>CYR51<br>CYR52<br>CYR53 |   | <b>Failure Rate</b><br>3 = M level, 1%/1000 hrs. | <b>Capacitance Code</b><br>Capacitance value<br>coded in accordance<br>with MIL-C-23269 –<br>(see Part Number section) |

### MARKING

|                                                                                                                                         |                                                                                                                                                                                                                                                                                                           |
|-----------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>CYR51, 52, 53</b>                                                                                                                    | M23269 = Military specification established reliability glass capacitor<br>J = JAN Trademark<br>10 = Slash sheet for case sizes – CYR51, CYR52, CYR53<br>3 = Failure rate (M level)<br>001 = Capacitance value coded in accordance with MIL-C-23269<br>AVX = AVX Corporation<br>05 = Year<br>B = Lot Code |
| <div style="border: 1px solid black; padding: 5px; width: fit-content;"> <b>M23269J</b><br/> <b>10-3001</b><br/> <b>AVX 05 B</b> </div> |                                                                                                                                                                                                                                                                                                           |

### CROSS REFERENCE

| MIL-C-23269<br>Style | MIL-C-11272<br>Style |
|----------------------|----------------------|
| CYR10                | CY10                 |
| CYR15                | CY15                 |
| CYR20                | CY20                 |
| CYR30                | CY30                 |
| CYR51                | CY06                 |
| CYR52                | CY07                 |
| CYR53                | CY08                 |

### RATINGS & PART NUMBER REFERENCE

| Cap. Value<br>(pF) |        | Part Number<br>Capacitance Tolerance |      |
|--------------------|--------|--------------------------------------|------|
| CYR51 M23269/10-   |        |                                      |      |
| 300 Volts          | ±.25pF | ±2%                                  | ±5%  |
| 1                  | 3001   | —                                    | —    |
| 1.5                | 3002   | —                                    | —    |
| 2.2                | 3003   | —                                    | —    |
| 2.7                | 3004   | —                                    | —    |
| 3.0                | 3005   | —                                    | —    |
| 3.3                | 3006   | —                                    | —    |
| 3.6                | 3007   | —                                    | —    |
| 3.9                | 3008   | —                                    | —    |
| 4.3                | 3009   | —                                    | —    |
| 4.7                | 3010   | —                                    | —    |
| 5.1                | 3011   | —                                    | 3012 |
| 5.6                | 3013   | —                                    | 3014 |
| 6.2                | 3015   | —                                    | 3016 |
| 6.8                | 3017   | —                                    | 3018 |
| 7.5                | 3019   | —                                    | 3020 |
| 8.2                | 3021   | —                                    | 3022 |
| 9.1                | 3023   | —                                    | 3024 |
| 10                 | 3025   | —                                    | 3026 |
| 11                 | 3027   | —                                    | 3028 |
| 12                 | 3029   | —                                    | 3030 |
| 13                 | 3031   | 3032                                 | 3033 |
| 15                 | 3034   | 3035                                 | 3036 |
| 16                 | 3037   | 3038                                 | 3039 |
| 18                 | 3040   | 3041                                 | 3042 |
| 20                 | 3043   | 3044                                 | 3045 |
| 22                 | 3046   | 3047                                 | 3048 |
| 24                 | 3049   | 3050                                 | 3051 |

\*Add first digit to indicate failure rate.

| Cap. Value<br>(pF)        | Part Number<br>Capacitance Tolerance |      |      |
|---------------------------|--------------------------------------|------|------|
| CYR51 M23269/10- (cont'd) |                                      |      |      |
| 300 Volts                 | ±1%                                  | ±2%  | ±5%  |
| 27                        | 3052                                 | 3053 | 3054 |
| 30                        | 3055                                 | 3056 | 3057 |
| 33                        | 3058                                 | 3059 | 3060 |
| 36                        | 3061                                 | 3062 | 3063 |
| 39                        | 3064                                 | 3065 | 3066 |
| 43                        | 3067                                 | 3068 | 3069 |
| 47                        | 3070                                 | 3071 | 3072 |
| 51                        | 3073                                 | 3074 | 3075 |
| 56                        | 3076                                 | 3077 | 3078 |
| 62                        | 3079                                 | 3080 | 3081 |
| 68                        | 3082                                 | 3083 | 3084 |
| 75                        | 3085                                 | 3086 | 3087 |
| 82                        | 3088                                 | 3089 | 3090 |
| 91                        | 3091                                 | 3092 | 3093 |
| 100                       | 3094                                 | 3095 | 3096 |
| 110                       | 3097                                 | 3098 | 3099 |
| 120                       | 3100                                 | 3101 | 3102 |
| 130                       | 3103                                 | 3104 | 3105 |
| 150                       | 3106                                 | 3107 | 3108 |
| 160                       | 3109                                 | 3110 | 3111 |
| 180                       | 3112                                 | 3113 | 3114 |
| 200                       | 3115                                 | 3116 | 3117 |
| 220                       | 3118                                 | 3119 | 3120 |
| 240                       | 3121                                 | 3122 | 3123 |
| 270                       | 3124                                 | 3125 | 3126 |
| 300                       | 3127                                 | 3128 | 3129 |
| 330                       | 3130                                 | 3131 | 3132 |
| 360                       | 3133                                 | 3134 | 3135 |
| 390                       | 3136                                 | 3137 | 3138 |
| 430                       | 3139                                 | 3140 | 3141 |
| 470                       | 3142                                 | 3143 | 3144 |
| 510                       | 3145                                 | 3146 | 3147 |
| 560                       | 3148                                 | 3149 | 3150 |

\*Add first digit to indicate failure rate.

| Cap. Value<br>(pF) | Part Number<br>Capacitance Tolerance |      |      |
|--------------------|--------------------------------------|------|------|
| CYR52 M23269/10-   |                                      |      |      |
| 300 Volts          | ±1%                                  | ±2%  | ±5%  |
| 620                | 3201                                 | 3202 | 3203 |
| 680                | 3204                                 | 3205 | 3206 |
| 750                | 3207                                 | 3208 | 3209 |
| 820                | 3210                                 | 3211 | 3212 |
| 910                | 3213                                 | 3214 | 3215 |
| 1,000              | 3216                                 | 3217 | 3218 |
| CYR53 M23269/10-   |                                      |      |      |
| 1,100              | 3301                                 | 3302 | 3303 |
| 1,200              | 3304                                 | 3305 | 3306 |
| 1,300              | 3307                                 | 3308 | 3309 |
| 1,500              | 3310                                 | 3311 | 3312 |
| 1,600              | 3313                                 | 3314 | 3315 |
| 1,800              | 3316                                 | 3317 | 3318 |
| 2,000              | 3319                                 | 3320 | 3321 |
| 2,200              | 3322                                 | 3323 | 3324 |
| 2,400              | 3325                                 | 3326 | 3327 |

\*Add first digit to indicate failure rate.



# Glass/ET Series Caps

## Elevated Temperature



### HEAT

It's the enemy of reliable, long-term circuit performance. In many applications, very high temperatures are not a consideration in circuit design. But in a few specialized areas, elevated temperatures create very real design problems.

That's why AVX ET-Series capacitors keep working at temperatures where more ordinary capacitors usually fail...up to 200°C.

And, of course, AVX ET-Series capacitors provide all the high performance,

high reliability characteristics you've come to expect from all AVX glass capacitors...excellent stability, outstanding capacitance retraceability, rugged, simple construction to eliminate mechanical problems, and electrical performance specifications among the best available at any price.

So when the heat's on your next design and you can't alter the environment, choose AVX ET-Series glass capacitors. That'll be one less problem you'll have to solve.

### FEATURES

- Available in both axial and radial leaded configurations
- Values from 0.5 pF to 2400 pF
- Working temperature range -75°C to 200°C
- "Burned In" versions available – 50 hours @ 1500 VDC, 25°C
- Simple, rugged design and construction
- Short lead times for most values

### STANDARD OPERATING CHARACTERISTICS OF AVX ET-SERIES AXIAL AND RADIAL LEADED GLASS CAPACITORS

|                                                         |                                                                                                                                                       |
|---------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| Working Temperature Range                               | -75°C to 200°C                                                                                                                                        |
| Voltage Rating                                          | 50 VDC                                                                                                                                                |
| Capacitance Range                                       | 0.5 pF to 2400 pF                                                                                                                                     |
| Insulation Resistance                                   | @ 25°C > 100,000 Megohms<br>@ 200°C > 100 Megohms                                                                                                     |
| Dissipation Factor                                      | @ 25°C < .1% at 1kHz<br>@ 200°C < 1% at 1kHz                                                                                                          |
| Life                                                    | (1000 hours at rated voltage at 200°C)<br>Post Test Delta C @ 25°C < 2%<br>DF @ 25°C < 2.5%<br>IR > 100 Megohms (axials)<br>IR > 10 Megohms (radials) |
| Short Time (1 Hour) Exposure to Overtemperature (250°C) | No degradation                                                                                                                                        |
| Voltage Coefficient                                     | 0                                                                                                                                                     |

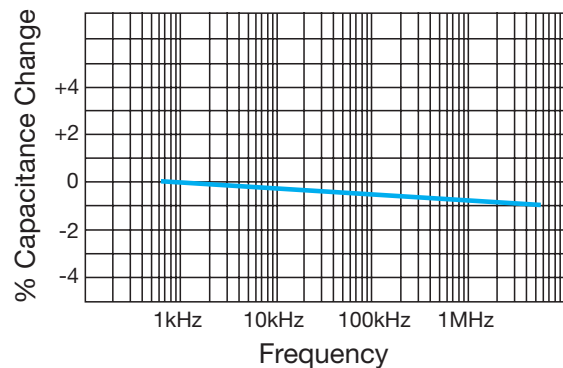
### TYPICAL APPLICATIONS

In general, AVX ET-Series glass capacitors are ideally suited for any environment where high temperature could alter or destroy circuit performance. And since they are rated down to -75°C, ET-Series capacitors are also useful where cycling to colder temperatures may be a problem. Some applications where AVX ET-Series capacitors have already proven themselves include:

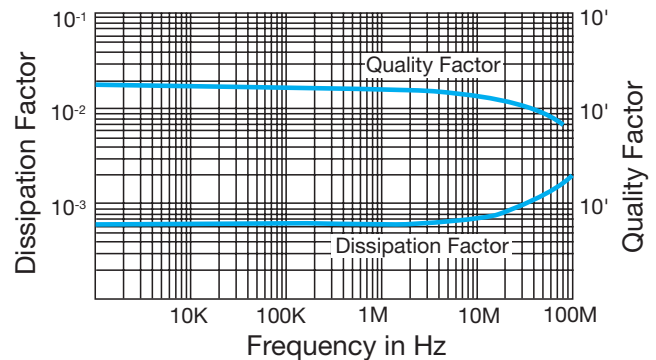
- Oil, well logging and downhole instrumentation, where frictional or geothermal heat is a problem.
- Geophysical pressure probes.
- Missile or aerospace applications where engine or environmental heat needs to be monitored or may cause circuit failure.
- Radar or other microwave applications.
- RF output circuitry where conduction or fan cooling cannot be entirely relied upon to remove all of the heat.
- Space and satellite applications where temperature changes are extreme and "zero failures" are a must.
- Industrial chemical process instrumentation where heat is a part of the process.
- Instrumentation for monitoring at-the-tool performance in metal cutting machinery.
- Fire-safe alarm or control circuitry.

# Glass/ET Series Caps

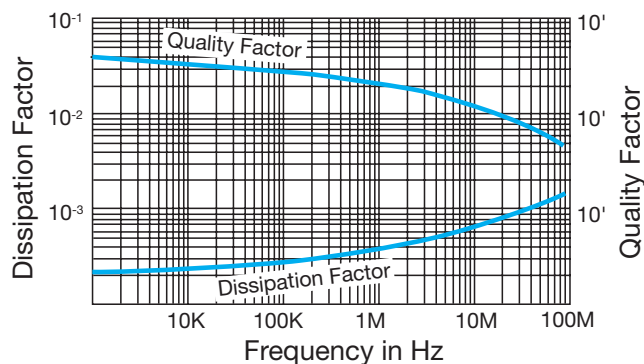
## Performance Curves



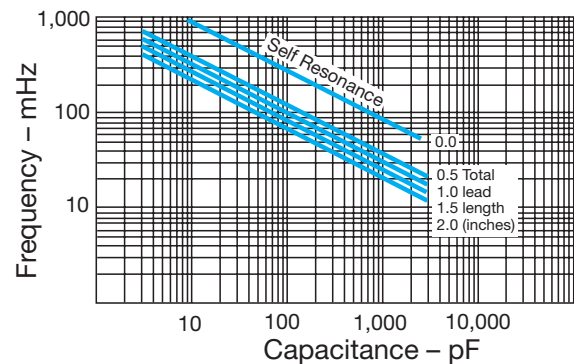
**% Capacitance Change vs. Frequency  
Radial and Axial**



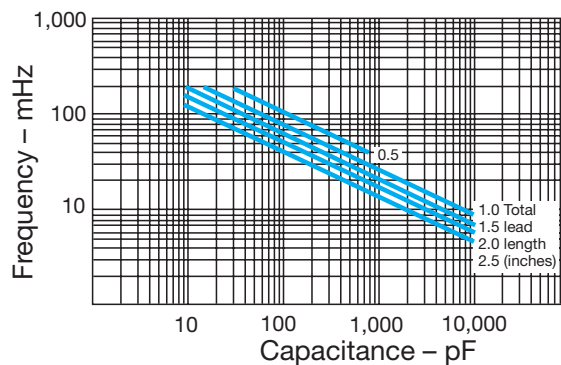
**Quality Factor and Dissipation Factor vs. Frequency  
Radial**



**Quality Factor and Dissipation Factor vs. Frequency  
Axial**



**Resonant Frequency vs. Capacitance  
Radial**



**Resonant Frequency vs. Capacitance  
Axial**



# Glass/ET Series Caps

## Axial Lead Elevated Temperature



### INTRODUCTION

AVX ET-Series axial leaded glass capacitors\* are available in two standard case sizes and in a wide range of values and tolerances. All feature extremely stable glass dielectric, fused monolithic construction and true glass-to-metal hermetic seals at the leads for moisture resistance. All case sizes conform to industry dimensional standards.

### PERFORMANCE CHARACTERISTICS

**Tolerance:** Available tolerances for each capacitance value are shown in the ordering information table on following page. Part marking codes are also provided.

**Temperature Coefficient:** Capacitance exhibits retraceability to within 10 ppm/°C over the temperature range -75°C to +200°C. See graph on following page.

**Voltage Coefficient:** Zero

**Losses:** Extremely low over the entire specified operating temperature range. Dissipation factor is 1% or less at 200°C at 1kHz.

**Life:** Delta C is less than 2% after 1000 hours at rated voltage, 200°C.

**Insulation Resistance:** Greater than 100,000 megohms at 25°C; greater than 100 megohms at 200°C. More than 100 megohms after life-testing.

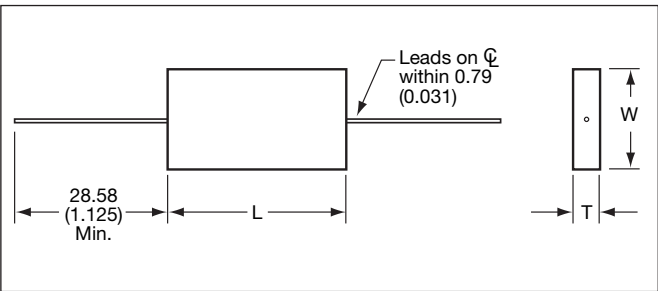
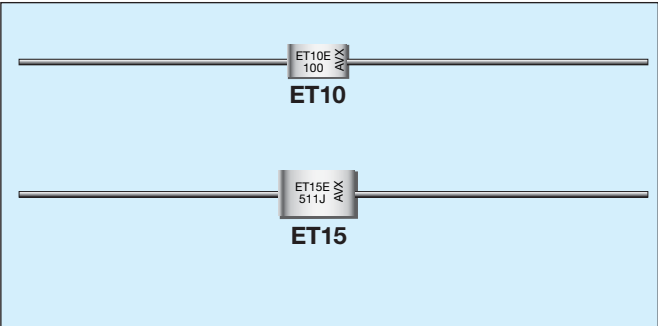
**Voltage/Temperature Rating:** All ET-Series capacitors are rated at 50 VDC over their operating temperature range of -75°C to 200°C. No derating is required.

**High Voltage Stabilization Screening:** A special version of ET-Series axial leaded capacitors – designated ETR – is available. These capacitors have been “burned in” at room temperature for 50 hours at 1500 VDC.

**Short Time Overtemperature Exposure:** After exposure to 250°C for one hour, ET-Series capacitors have continued to perform to specification.

**Moisture Resistance:** Axial glass capacitors are hermetically sealed in glass, with a true metal-to-glass seal at the leads. This construction provides practical immunity to environmental effects such as shock, moisture, salt spray and solder heat.

Additional performance details are given in the AVX “Performance Characteristics of Multilayer Glass Dielectric Capacitors” technical paper.



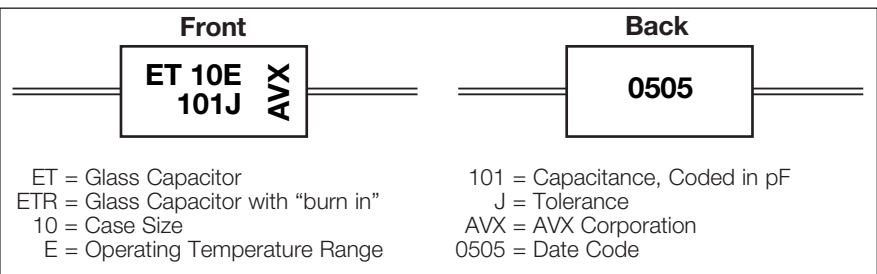
### DIMENSIONS:

millimeters (inches)

| Case Size | L                               | W                              | T                              | Lead Dia.<br>+0.1 (+0.004)<br>-0.03 (-0.001) | Weight<br>(grams) |
|-----------|---------------------------------|--------------------------------|--------------------------------|----------------------------------------------|-------------------|
| ET10      | 8.74 ± 1.19<br>(0.344 ± 0.047)  | 4.37 ± 0.79<br>(0.172 ± 0.031) | 1.98 ± 0.79<br>(0.078 ± 0.031) | 5.08<br>(0.200)                              | .25 - .50         |
| ET15      | 11.91 ± 1.19<br>(0.469 ± 0.047) | 6.76 ± 0.79<br>(0.266 ± 0.031) | 2.77 ± 1.19<br>(0.109 ± 0.047) | 5.08<br>(0.200)                              | .75 - 1.25        |

**Note:** Standard leads are solder-coated Dumet.

### MARKING



\*Radiation Resistance to the same level as the CY, CYR axial series.



# Glass/ET Series Caps

## Part Numbers and Ordering Information



### HOW TO ORDER

|                                 |                              |                                                       |                                                                                                                                                                                                                                                                                               |                                                                                                                     |
|---------------------------------|------------------------------|-------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|
| <b>ET</b>                       | <b>10</b>                    | <b>E</b>                                              | <b>101</b>                                                                                                                                                                                                                                                                                    | <b>J</b>                                                                                                            |
| <b>Style</b><br>Glass Capacitor | <b>Case Size</b><br>10<br>15 | <b>Operating Temperature Range</b><br>-75°C to +200°C | <b>Capacitance Code</b><br>Capacitance Code is expressed in picofarads (pF). The first two digits represent significant figures and the third digit specifies the number of zeros to follow; i.e. 101 indicates 100 pF. For values below 10 pF, R = decimal point; i.e. 1R5 indicates 1.5 pF. | <b>Capacitance Tolerance</b><br>C = ±.25 pF<br>D = ±.50 pF<br>F = ±1%<br>G = ±2%<br>J = ±5%<br>K = ±10%<br>M = ±20% |

### RATINGS & PART NUMBER REFERENCE (Standard Values)

| ET Part No.                 | ETR Part No. | Cap (pF) | Tolerances Available Voltage | DC Working |
|-----------------------------|--------------|----------|------------------------------|------------|
| <b>ET10, ETR10</b>          |              |          |                              |            |
| ET10E0R5 *                  | ETR10E0R5 ** | 0.5      | C                            | 50         |
| ET10E1R0                    | ETR10E1R0    | 1.0      | C, D                         | 50         |
| ET10E1R5                    | ETR10E1R5    | 1.5      | C, D                         | 50         |
| ET10E2R2                    | ETR10E2R2    | 2.2      | C, D                         | 50         |
| ET10E2R7                    | ETR10E2R7    | 2.7      | C, D                         | 50         |
| ET10E3R0                    | ETR10E3R0    | 3.0      | C, D                         | 50         |
| ET10E3R3                    | ETR10E3R3    | 3.3      | C, D                         | 50         |
| ET10E3R6                    | ETR10E3R6    | 3.6      | C, D                         | 50         |
| ET10E3R9                    | ETR10E3R9    | 3.9      | C, D                         | 50         |
| ET10E4R3                    | ETR10E4R3    | 4.3      | C, D                         | 50         |
| ET10E4R7                    | ETR10E4R7    | 4.7      | C, K                         | 50         |
| ET10E5R1                    | ETR10E5R1    | 5.1      | C, J, K                      | 50         |
| ET10E5R6                    | ETR10E5R6    | 5.6      | C, J, K                      | 50         |
| ET10E6R2                    | ETR10E6R2    | 6.2      | C, J, K                      | 50         |
| ET10E6R8                    | ETR10E6R8    | 6.8      | C, J, K                      | 50         |
| ET10E7R5                    | ETR10E7R5    | 7.5      | C, J, K                      | 50         |
| ET10E8R2                    | ETR10E8R2    | 8.2      | C, J, K                      | 50         |
| ET10E9R1                    | ETR10E9R1    | 9.1      | C, J, K                      | 50         |
| ET10E100                    | ETR10E100    | 10       | C, J, K, M                   | 50         |
| ET10E110                    | ETR10E110    | 11       | C, J, K, M                   | 50         |
| ET10E120                    | ETR10E120    | 12       | C, J, K, M                   | 50         |
| ET10E130                    | ETR10E130    | 13       | C, G, J, K, M                | 50         |
| ET10E150                    | ETR10E150    | 15       | C, G, J, K, M                | 50         |
| ET10E160                    | ETR10E160    | 16       | C, G, J, K, M                | 50         |
| ET10E180                    | ETR10E180    | 18       | C, G, J, K, M                | 50         |
| ET10E200                    | ETR10E200    | 20       | C, G, J, K, M                | 50         |
| ET10E220                    | ETR10E220    | 22       | C, G, J, K, M                | 50         |
| ET10E240                    | ETR10E240    | 24       | C, G, J, K, M                | 50         |
| ET10E270                    | ETR10E270    | 27       | F, G, J, K, M                | 50         |
| ET10E300                    | ETR10E300    | 30       | F, G, J, K, M                | 50         |
| ET10E330                    | ETR10E330    | 33       | F, G, J, K, M                | 50         |
| ET10E360                    | ETR10E360    | 36       | F, G, J, K, M                | 50         |
| ET10E390                    | ETR10E390    | 39       | F, G, J, K, M                | 50         |
| ET10E430                    | ETR10E430    | 43       | F, G, J, K, M                | 50         |
| ET10E470                    | ETR10E470    | 47       | F, G, J, K, M                | 50         |
| ET10E510                    | ETR10E510    | 51       | F, G, J, K, M                | 50         |
| ET10E560                    | ETR10E560    | 56       | F, G, J, K, M                | 50         |
| ET10E620                    | ETR10E620    | 62       | F, G, J, K, M                | 50         |
| ET10E680                    | ETR10E680    | 68       | F, G, J, K, M                | 50         |
| ET10E750                    | ETR10E750    | 75       | F, G, J, K, M                | 50         |
| <b>ET10, ETR10 (cont'd)</b> |              |          |                              |            |
| ET10E820                    | ETR10E820    | 82       | F, G, J, K, M                | 50         |
| ET10E910                    | ETR10E910    | 91       | F, G, J, K, M                | 50         |
| ET10E101                    | ETR10E101    | 100      | F, G, J, K, M                | 50         |
| ET10E111                    | ETR10E111    | 110      | F, G, J, K, M                | 50         |
| ET10E121                    | ETR10E121    | 120      | F, G, J, K, M                | 50         |
| ET10E131                    | ETR10E131    | 130      | F, G, J, K, M                | 50         |
| ET10E151                    | ETR10E151    | 150      | F, G, J, K, M                | 50         |
| ET10E161                    | ETR10E161    | 160      | F, G, J, K, M                | 50         |
| ET10E181                    | ETR10E181    | 180      | F, G, J, K, M                | 50         |
| ET10E201                    | ETR10E201    | 200      | F, G, J, K, M                | 50         |
| ET10E221                    | ETR10E221    | 220      | F, G, J, K, M                | 50         |
| ET10E241                    | ETR10E241    | 240      | F, G, J, K, M                | 50         |
| ET10E271                    | ETR10E271    | 270      | F, G, J, K, M                | 50         |
| ET10E301                    | ETR10E301    | 300      | F, G, J, K, M                | 50         |
| <b>ET15, ETR15</b>          |              |          |                              |            |
| ET15E221                    | ETR15E221    | 220      | F, G, J, K, M                | 50         |
| ET15E241                    | ETR15E241    | 240      | F, G, J, K, M                | 50         |
| ET15E271                    | ETR15E271    | 270      | F, G, J, K, M                | 50         |
| ET15E301                    | ETR15E301    | 300      | F, G, J, K, M                | 50         |
| ET15E331                    | ETR15E331    | 330      | F, G, J, K, M                | 50         |
| ET15E361                    | ETR15E361    | 360      | F, G, J, K, M                | 50         |
| ET15E391                    | ETR15E391    | 390      | F, G, J, K, M                | 50         |
| ET15E431                    | ETR15E431    | 430      | F, G, J, K, M                | 50         |
| ET15E471                    | ETR15E471    | 470      | F, G, J, K, M                | 50         |
| ET15E511                    | ETR15E511    | 510      | F, G, J, K, M                | 50         |
| ET15E561                    | ETR15E561    | 560      | F, G, J, K, M                | 50         |
| ET15E621                    | ETR15E621    | 620      | F, G, J, K, M                | 50         |
| ET15E681                    | ETR15E681    | 680      | F, G, J, K, M                | 50         |
| ET15E751                    | ETR15E751    | 750      | F, G, J, K, M                | 50         |
| ET15E821                    | ETR15E821    | 820      | F, G, J, K, M                | 50         |
| ET15E911                    | ETR15E911    | 910      | F, G, J, K, M                | 50         |
| ET15E102                    | ETR15E102    | 1000     | F, G, J, K, M                | 50         |
| ET15E112                    | ETR15E112    | 1100     | F, G, J, K, M                | 50         |
| ET15E122                    | ETR15E122    | 1200     | F, G, J, K, M                | 50         |

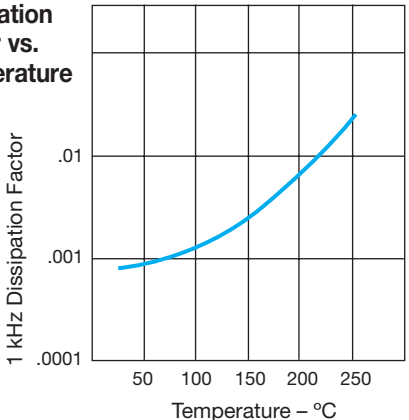
Add letter for tolerance code above lines.

These capacitors include a "burn in", see page 20 High Voltage Stabilization Screening.

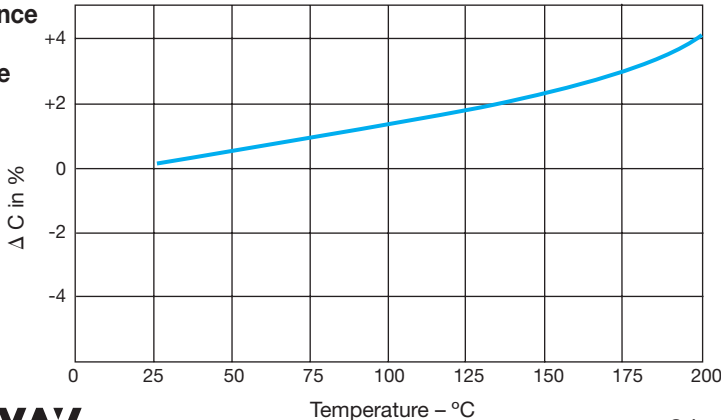
Add letter for tolerance code above lines.

These capacitors include a "burn in", see page 20 High Voltage Stabilization Screening.

**Dissipation Factor vs. Temperature Axial**



**% Capacitance Change vs. Temperature Axial**



# Glass/ET Series Caps

## Radial Lead Elevated Temperature



### INTRODUCTION

AVX ET-Series radial leaded glass capacitors are available in a broad range of tolerances and values in three case sizes. The fused monolithic capacitive element is housed in a miniature rectangular molded case for high packaging efficiency in circuit board applications. The gold-plated Dumet leads can be soldered or welded.

### PERFORMANCE CHARACTERISTICS

**Tolerance:** The ordering information table on the opposite page gives the available tolerances and values. An explanation of the part marking code is also provided.

**Temperature Coefficient:** Capacitance exhibits retraceability to within 10 ppm/°C over the temperature range -75°C to 200°C. See graph on following page.

**Voltage Coefficient:** Zero

**Losses:** Over the specified temperature range, losses are very low. At 200°C, 1kHz, the dissipation factor is 1% or less.

**Life:** Delta C is less than 2% after 1000 hours at rated voltage, 200°C.

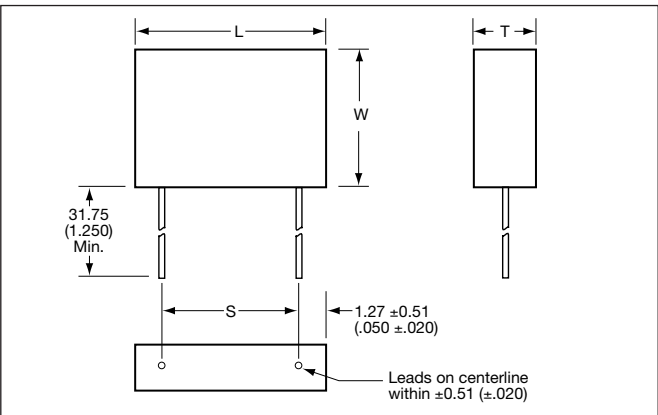
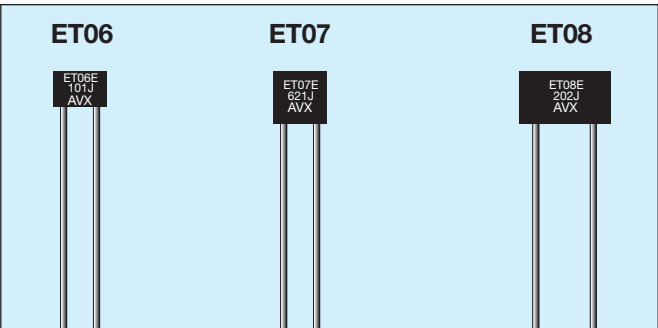
**Insulation Resistance:** 100,000 megohms or greater at 25°C; 100 megohms or greater at 200°C. More than 10 megohms after 1000 hour life-test.

**Voltage/Temperature Rating:** All ET-Series capacitors are rated at 50 VDC over the operating temperature range of -75°C to 200°C. Derating is not required.

**High Voltage Stabilization Screening:** A special version of ET-Series radial leaded capacitors – designated ETR – is available. These capacitors have been “burned in” at room temperature for 50 hours at 1500 VDC.

**Short Time Overtemperature Exposure:** After exposure to 250°C for one hour, ET-Series capacitors have continued to perform to specification.

Additional performance details are given in the AVX “Performance Characteristics of Multilayer Glass Dielectric Capacitors” technical paper.

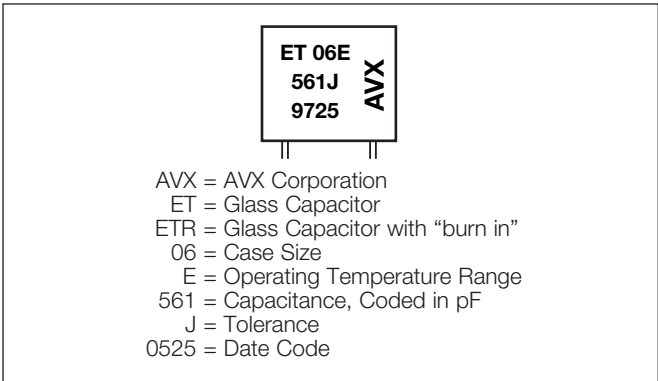


### DIMENSIONS:

| Case Size | L<br>±0.13<br>(±0.005) | W<br>±0.25<br>(±0.010) | T<br>±0.13<br>(±0.005) | S<br>±0.51<br>(±0.020) | Weight<br>(grams) |
|-----------|------------------------|------------------------|------------------------|------------------------|-------------------|
| ET06      | 7.62 (0.300)           | 5.08 (0.200)           | 2.92 (0.115)           | 5.08 (0.200)           | .3 - .4           |
| ET07      | 7.62 (0.300)           | 7.62 (0.300)           | 2.92 (0.115)           | 5.08 (0.200)           | .4 - .5           |
| ET08      | 12.7 (0.500)           | 7.62 (0.300)           | 2.92 (0.115)           | 10.16 (0.400)          | .7 - .8           |

**Note:** All leads are 24 AWG, 0.51± 0.05 (0.020±0.002) diameter. Leads are solderable and welded gold-plated Dumet.

### MARKING



# Glass/ET Series Caps

## Part Numbers and Ordering Information



### HOW TO ORDER

**ET**  
Style  
Glass Capacitor

**06**  
Case Size  
06  
07  
08

**E**  
Operating  
Temperature Range  
-75°C to +200°C

**561**  
Capacitance Code  
Capacitance Code is expressed in picofarads (pF). The first two digits represent significant figures and the third digit specifies the number of zeros to follow; i.e. 561 indicates 560 pF. For values below 10 pF, R = decimal point; i.e. 1R5 indicates 1.5 pF.

**J**  
Capacitance Tolerance  
C = ±.25 pF  
D = ±.50 pF  
F = ±1%  
G = ±2%  
J = ±5%  
K = ±10%  
M = ±20%

### RATINGS & PART NUMBER REFERENCE (Standard Values)

| ET Part No.        | ETR Part No. | Cap (pF) | Tolerances Available Voltage | DC Working |
|--------------------|--------------|----------|------------------------------|------------|
| <b>ET06, ETR06</b> |              |          |                              |            |
| ET06E1R0 *         | ETR06E1R0 ** | 1.0      | C, D                         | 50         |
| ET06E1R5           | ETR06E1R5    | 1.5      | C, D                         | 50         |
| ET06E2R2           | ETR06E2R2    | 2.2      | C, D                         | 50         |
| ET06E2R7           | ETR06E2R7    | 2.7      | C, D                         | 50         |
| ET06E3R0           | ETR06E3R0    | 3.0      | C, D                         | 50         |
| ET06E3R3           | ETR06E3R3    | 3.3      | C, D                         | 50         |
| ET06E3R6           | ETR06E3R6    | 3.6      | C, D                         | 50         |
| ET06E3R9           | ETR06E3R9    | 3.9      | C, D                         | 50         |
| ET06E4R3           | ETR06E4R3    | 4.3      | C, D                         | 50         |
| ET06E4R7           | ETR06E4R7    | 4.7      | C, K                         | 50         |
| ET06E5R1           | ETR06E5R1    | 5.1      | C, J, K                      | 50         |
| ET06E5R6           | ETR06E5R6    | 5.6      | C, J, K                      | 50         |
| ET06E6R2           | ETR06E6R2    | 6.2      | C, J, K                      | 50         |
| ET06E6R8           | ETR06E6R8    | 6.8      | C, J, K                      | 50         |
| ET06E7R5           | ETR06E7R5    | 7.5      | C, J, K                      | 50         |
| ET06E8R2           | ETR06E8R2    | 8.2      | C, J, K                      | 50         |
| ET06E9R1           | ETR06E9R1    | 9.1      | C, J, K                      | 50         |
| ET06E100           | ETR06E100    | 10       | C, J, K, M                   | 50         |
| ET06E110           | ETR06E110    | 11       | C, J, K, M                   | 50         |
| ET06E120           | ETR06E120    | 12       | C, J, K, M                   | 50         |
| ET06E130           | ETR06E130    | 13       | C, G, J, K, M                | 50         |
| ET06E150           | ETR06E150    | 15       | C, G, J, K, M                | 50         |
| ET06E160           | ETR06E160    | 16       | C, G, J, K, M                | 50         |
| ET06E180           | ETR06E180    | 18       | C, G, J, K, M                | 50         |
| ET06E200           | ETR06E200    | 20       | C, G, J, K, M                | 50         |
| ET06E220           | ETR06E220    | 22       | C, G, J, K, M                | 50         |
| ET06E240           | ETR06E240    | 24       | C, G, J, K, M                | 50         |
| ET06E270           | ETR06E270    | 27       | F, G, J, K, M                | 50         |
| ET06E300           | ETR06E300    | 30       | F, G, J, K, M                | 50         |
| ET06E330           | ETR06E330    | 33       | F, G, J, K, M                | 50         |
| ET06E360           | ETR06E360    | 36       | F, G, J, K, M                | 50         |
| ET06E390           | ETR06E390    | 39       | F, G, J, K, M                | 50         |
| ET06E430           | ETR06E430    | 43       | F, G, J, K, M                | 50         |
| ET06E470           | ETR06E470    | 47       | F, G, J, K, M                | 50         |
| ET06E510           | ETR06E510    | 51       | F, G, J, K, M                | 50         |
| ET06E560           | ETR06E560    | 56       | F, G, J, K, M                | 50         |
| ET06E620           | ETR06E620    | 62       | F, G, J, K, M                | 50         |
| ET06E680           | ETR06E680    | 68       | F, G, J, K, M                | 50         |
| ET06E750           | ETR06E750    | 75       | F, G, J, K, M                | 50         |
| ET06E820           | ETR06E820    | 82       | F, G, J, K, M                | 50         |

Add letter for tolerance code above lines.

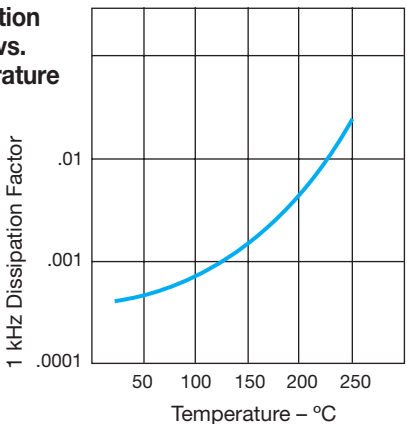
These capacitors include a "burn in", see page 22 High Voltage Stabilization Screening.

| ET Part No.                 | ETR Part No. | Cap (pF) | Tolerances Available Voltage | DC Working |
|-----------------------------|--------------|----------|------------------------------|------------|
| <b>ET06, ETR06 (cont'd)</b> |              |          |                              |            |
| ET06E910                    | ETR06E910    | 91       | F, G, J, K, M                | 50         |
| ET06E101                    | ETR06E101    | 100      | F, G, J, K, M                | 50         |
| ET06E111                    | ETR06E111    | 110      | F, G, J, K, M                | 50         |
| ET06E121                    | ETR06E121    | 120      | F, G, J, K, M                | 50         |
| ET06E131                    | ETR06E131    | 130      | F, G, J, K, M                | 50         |
| ET06E151                    | ETR06E151    | 150      | F, G, J, K, M                | 50         |
| ET06E161                    | ETR06E161    | 160      | F, G, J, K, M                | 50         |
| ET06E181                    | ETR06E181    | 180      | F, G, J, K, M                | 50         |
| ET06E201                    | ETR06E201    | 200      | F, G, J, K, M                | 50         |
| ET06E221                    | ETR06E221    | 220      | F, G, J, K, M                | 50         |
| ET06E241                    | ETR06E241    | 240      | F, G, J, K, M                | 50         |
| ET06E271                    | ETR06E271    | 270      | F, G, J, K, M                | 50         |
| ET06E301                    | ETR06E301    | 300      | F, G, J, K, M                | 50         |
| ET06E331                    | ETR06E331    | 330      | F, G, J, K, M                | 50         |
| ET06E361                    | ETR06E361    | 360      | F, G, J, K, M                | 50         |
| ET06E391                    | ETR06E391    | 390      | F, G, J, K, M                | 50         |
| ET06E431                    | ETR06E431    | 430      | F, G, J, K, M                | 50         |
| ET06E471                    | ETR06E471    | 470      | F, G, J, K, M                | 50         |
| ET06E511                    | ETR06E511    | 510      | F, G, J, K, M                | 50         |
| ET06E561                    | ETR06E561    | 560      | F, G, J, K, M                | 50         |
| <b>ET07, ETR07</b>          |              |          |                              |            |
| ET07E621 *                  | ETR07E621 ** | 620      | F, G, J, K, M                | 50         |
| ET07E681                    | ETR07E681    | 680      | F, G, J, K, M                | 50         |
| ET07E751                    | ETR07E751    | 750      | F, G, J, K, M                | 50         |
| ET07E821                    | ETR07E821    | 820      | F, G, J, K, M                | 50         |
| ET07E911                    | ETR07E911    | 910      | F, G, J, K, M                | 50         |
| ET07E102                    | ETR07E102    | 1000     | F, G, J, K, M                | 50         |
| <b>ET08, ETR08</b>          |              |          |                              |            |
| ET08E112 *                  | ETR08E112 ** | 1100     | F, G, J, K, M                | 50         |
| ET08E122                    | ETR08E122    | 1200     | F, G, J, K, M                | 50         |
| ET08E132                    | ETR08E132    | 1300     | F, G, J, K, M                | 50         |
| ET08E152                    | ETR08E152    | 1500     | F, G, J, K, M                | 50         |
| ET08E162                    | ETR08E162    | 1600     | F, G, J, K, M                | 50         |
| ET08E182                    | ETR08E182    | 1800     | F, G, J, K, M                | 50         |
| ET08E202                    | ETR08E202    | 2000     | F, G, J, K, M                | 50         |
| ET08E222                    | ETR08E222    | 2200     | F, G, J, K, M                | 50         |
| ET08E242                    | ETR08E242    | 2400     | F, G, J, K, M                | 50         |

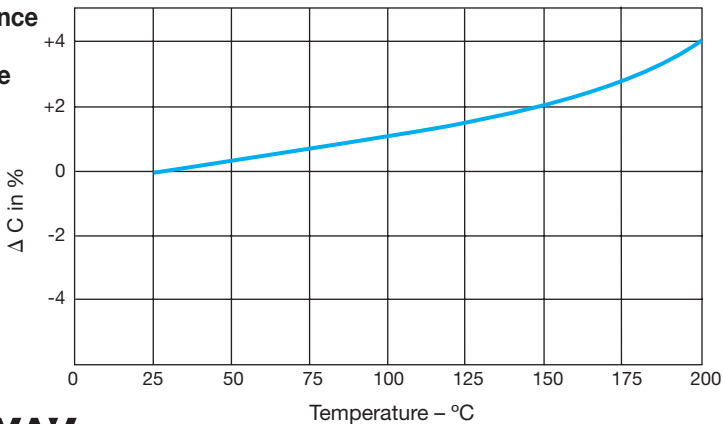
Add letter for tolerance code above lines.

These capacitors include a "burn in", see page 22 High Voltage Stabilization Screening.

**Dissipation Factor vs. Temperature**  
Radial



**% Capacitance Change vs. Temperature**  
Radial



### INTRODUCTION

The Glass-K capacitor is a miniature stable device that exhibits a high capacitance-to-volume ratio. It offers the size advantages of ceramic capacitors and the consistent performance associated with glass dielectrics made possible by development of a proprietary dielectric material.

Glass-K capacitors' physical size and value range meet the requirements of both military and commercial applications. The larger capacitance values are ideally suited for point-of-use filtering in military combat hardened computers, while the smaller capacitors are typically utilized in low loss, high speed circuitry. Applications such as jet engine monitoring circuitry, military instrumentation, and elevated temperature burn-in ovens are typical Glass-K applications.

### RELIABILITY

AVX Glass-K capacitors are qualified to MIL-C-11015/25 and MIL-C-39014/21, failure rate level M.

The reasons for the miniature size, high electrical performance, and high reliability of Glass-K capacitors are as follows:

- **Superior Dielectric** – The Glass-K capacitors' dielectric is formed by ceramizing a specially prepared glass.
- **Proven Construction Techniques** – AVX utilizes a stable, closely controlled process to construct Glass-K capacitors. Additionally, tight incoming material QC requirements add to the consistent performance of the product.
- **Quality Assurance** – Each lot of Glass-K capacitors is required to meet rigorous visual inspection criteria. Production inspection includes 100% testing for capacitance, dissipation factor, insulation resistance, and dielectric strength.

General performance guidelines are as follows:

**Construction** – The following materials are utilized in Glass-K capacitors: Glass-K dielectric, gold electrodes, silver termination, lead attach solder, lead wire, and silicone encapsulant. Tight requirements are placed upon all incoming materials.

**Performance** – The following Glass-K capacitors are described in this catalog:

|                               |                                                                                                                               |
|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| Product style<br>CK31, CK32   | Qualified to MIL-C-11015/25, standard military specification and used in industrial applications.                             |
| Product style<br>CKR31, CKR32 | Qualified to MIL-C-39014/21, established reliability specification and also used in high reliability commercial applications. |
| Product style<br>ET31, ET32   | Qualified to AVX elevated temperature internal specification, used primarily for high temperature circuitry up to +200°C.     |

**Capacitance Change vs. Temperature** – The change in capacitance over temperatures from -55°C to +125°C is as follows:

|                |            |
|----------------|------------|
| BT Dielectric: | +2%, -10%  |
| BU Dielectric: | +2%, -15%  |
| BV Dielectric: | +20%, -45% |

See Graphs 1 and 2 for further details.

**Capacitance Change vs. Voltage** – The change in capacitance over operating temperatures from -55°C to +125°C with rated voltage is as follows:

|                |            |
|----------------|------------|
| BT Dielectric: | +2%, -10%  |
| BU Dielectric: | +2%, -15%  |
| BV Dielectric: | +20%, -50% |

See Graphs 3 and 4 for further details.

**Losses vs. Temperature** – The maximum dissipation factor for CK and CKR series at 25°C:

|               |        |
|---------------|--------|
| BT Dielectric | ≤ 1.0% |
| BU Dielectric | ≤ 1.5% |
| BV Dielectric | ≤ 3.0% |

See Graph 5 for further details.

**Insulation Resistance** – CKR series – at 25°C, 100,000 megohms or 1000 megohm-microfarads. At 125°C, 10,000 megohms or 100 megohm-microfarads.

CK series – at 25°C, 100,000 megohms or 1000 megohm-microfarads, whichever is less.

ET Series – 200°C Insulation Resistance is as follows:

|                  |                       |
|------------------|-----------------------|
| K250 Dielectric: | 1 x 10 <sup>8</sup> Ω |
| K380 Dielectric: | 1 x 10 <sup>8</sup> Ω |
| K888 Dielectric: | 1 x 10 <sup>8</sup> Ω |

**Resonant Frequency vs. Capacitance** – Resonant Frequency vs. Capacitance as shown in Figure 6; Impedance vs. Frequency as shown in Figure 7.

**Temperature Range** – The operating temperature range for all Glass-K CK, CKR capacitors is -55°C to +125°C. The Elevated Temperature (ET) series operating temperature range is -75°C to +200°C with no voltage derating required.

**Life** – CKR Life: Meets or exceeds requirements of MIL-C-39014. At 200% of rated voltage, 125°C, at 4000 hours, the capacitance change for each stability characteristic is as follows:

|     |      |
|-----|------|
| BT: | ±2%  |
| BU: | ±10% |
| BV: | ±20% |

CK Life: Meets or exceeds requirements of MIL-C-11015. At 200% of rated voltage, 125°C, the maximum capacitance change for each stability characteristic is as follows:

|     |      |
|-----|------|
| BT: | ±2%  |
| BU: | ±5%  |
| BV: | ±20% |

ET Life: Meets or exceeds requirements of internal AVX ET specification for 250 hour life performance at 200°C.

**Packaging** –

- Bulk – 25 pieces strip  
125 pieces compartment

Taped – N/A

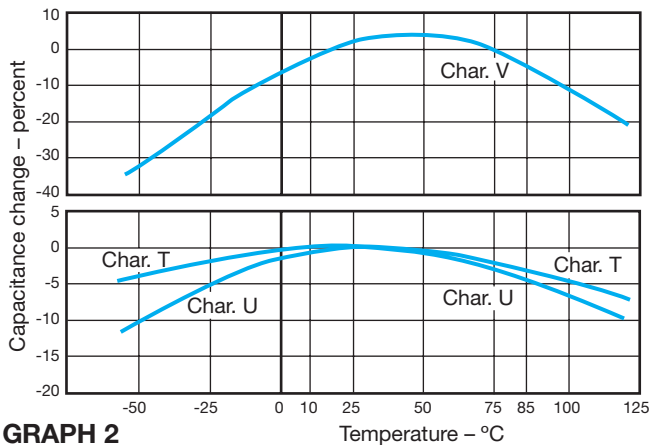
# Glass-K Capacitors

## Performance Curves



**GRAPH 1**

**% Capacitance Change vs. Temperature**

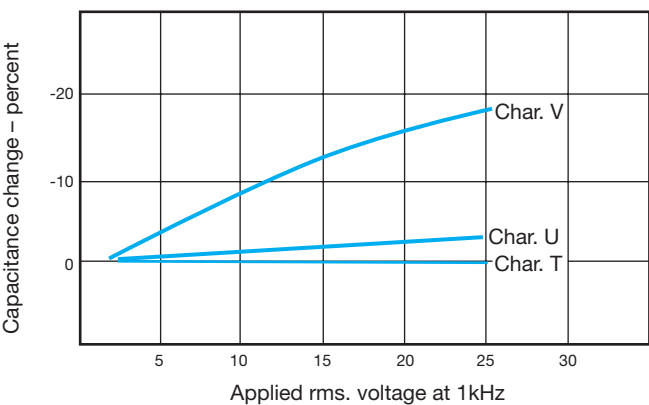


**GRAPH 2**

Temperature – °C

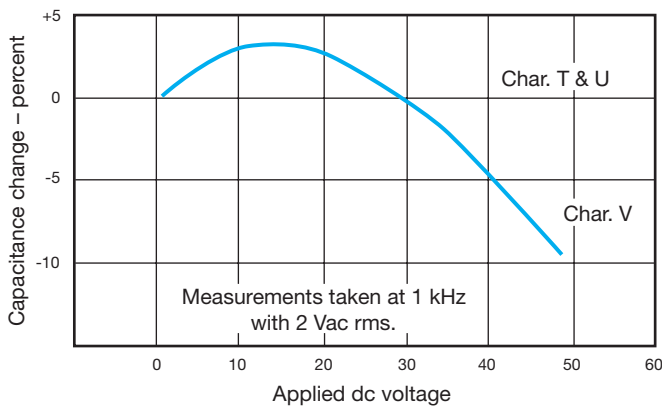
**GRAPH 3**

**% Capacitance Change vs. ac Voltage**



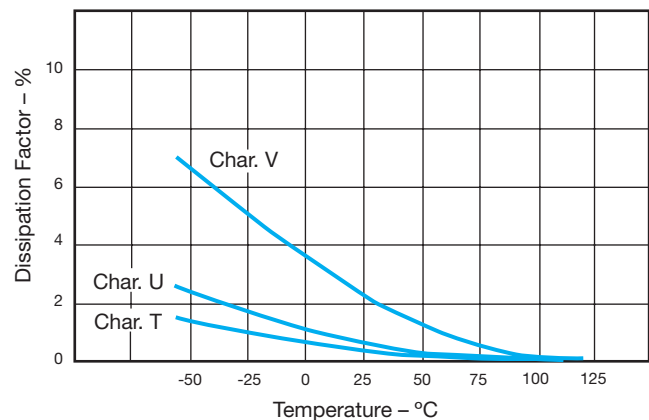
**GRAPH 4**

**% Capacitance Change vs. dc Voltage**



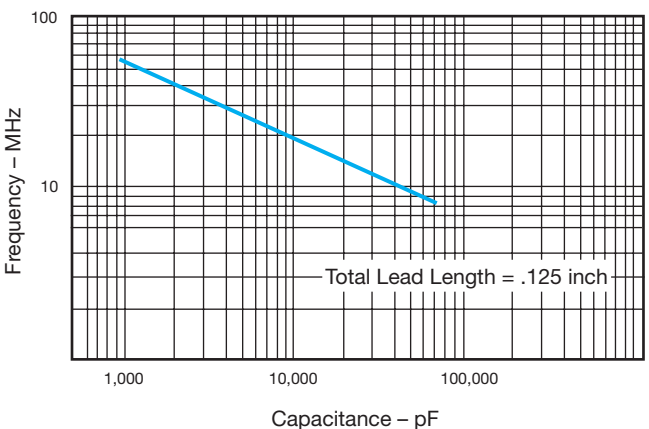
**GRAPH 5**

**Dissipation Factor vs. Temperature**



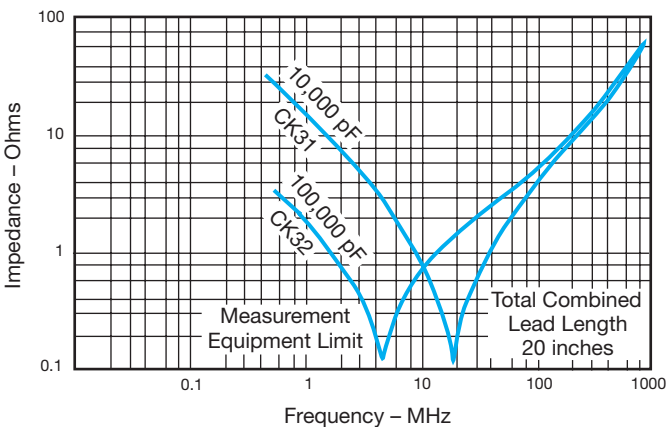
**GRAPH 6**

**Resonant Frequency vs. Capacitance**



**GRAPH 7**

**Impedance vs. Frequency**



# Glass-K Capacitors

## CK31, 32 (QPL to MIL-C-11015/25)



### APPLICATIONS

These miniature multilayer ceramic capacitors, style CK31 and CK32, meet or exceed all requirements of MIL-C-11015/25. High volumetric efficiency and reliable performance result from the special GLASS-K dielectric, which is fused into a compact monolithic structure. Available in three different stability characteristics, these capacitors are suitable for both military and commercial applications in miniature circuitry.

### PERFORMANCE CHARACTERISTICS

**Tolerance:**  $\pm 20\%$  and  $\pm 10\%$  in characteristics "U" and "V", and  $\pm 10\%$  and  $\pm 5\%$  in characteristic "T".

**Stability Characteristics:** Available as follows:

BT-TC: +2, -10%; TVC: +2, -10%

BU-TC: +2, -15%; TVC: +2, -15%

BV-TC: +20, -45%; TVC: +20, -50%

**Dissipation Factor:**

BT:  $\leq 1.0\%$

BU:  $\leq 1.5\%$

BV:  $\leq 3.0\%$

**Life:** Meets or exceeds requirements of MIL-C-11015. At 200% of rated voltage, 125°C, the maximum capacitance change for each stability characteristic is as follows:

BT:  $\pm 2\%$

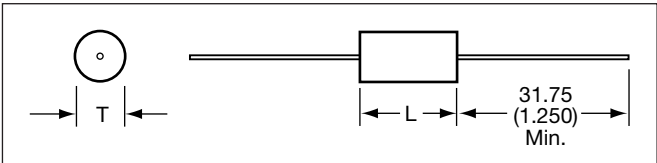
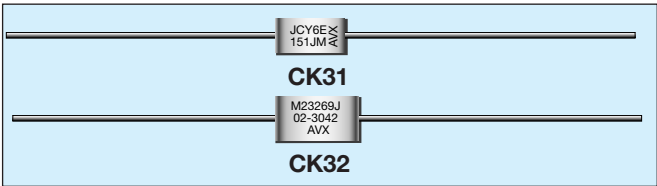
BU:  $\pm 5\%$

BV:  $\pm 20\%$

**Insulation Resistance:** 100,000 megohms or 1,000 megohm-microfarads, whichever is less.

**Voltage/Temperature Ratings:** Rated voltage is 50 Vdc. The operating temperature range is -55°C to +125°C.

**Moisture Resistance:** Meets or exceeds requirements of MIL-C-11015 and MIL-STD-202, Method 106. The capacitance change is less than 2% for stability characteristics T and U, and less than 5% for characteristic V.



### DIMENSIONS:

millimeters (inches)

| Case Size | L<br>$\pm .254$ (0.010) | D<br>$\pm .254$ (0.010) | Lead Dia.<br>$+0.1(+0.004)$<br>$-0.03(\pm 0.001)$ | Weight<br>(Grams)<br>(Typ.) |
|-----------|-------------------------|-------------------------|---------------------------------------------------|-----------------------------|
| CK31      | 6.09<br>(0.240)         | 2.29<br>(0.090)         | .41<br>(0.016)                                    | .2                          |
| CK32      | 6.09<br>(0.240)         | 3.30<br>(0.130)         | .41<br>(0.016)                                    | .3                          |

**Note:** Leads are gold-plated, solderable and weldable Dumet per MIL-STD-1276, Type D.

### QUICK SELECTION GUIDE

| Capacitance – pF | Style CK | Stability Char. |
|------------------|----------|-----------------|
| 270 – 10,000     | 31       | BT              |
| 12,000 – 20,000  | 31<br>32 | BU<br>BT        |
| 22,000 – 39,000  | 31<br>32 | BV<br>BU        |
| 47,000 – 51,000  | 31       | BV              |
| 56,000 – 100,000 | 32       | BV              |

# Glass-K Capacitors

## Part Numbers and Ordering Information



### HOW TO ORDER

|           |           |                             |                                               |                                                                                                                                                                                              |                                                |
|-----------|-----------|-----------------------------|-----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|
| <b>CK</b> | <b>31</b> | <b>B</b>                    | <b>T</b>                                      | <b>103</b>                                                                                                                                                                                   | <b>K</b>                                       |
| Style     | Case Size | Operating Temperature Range | Stability Characteristic                      | Capacitance Code                                                                                                                                                                             | Capacitance Tolerance                          |
|           | 31<br>32  | -55°C to +125°C             | T = +2% -10%<br>U = +2% -15%<br>V = +20% -45% | Capacitance Code expressed in picofarads (pF). The first two digits represent significant figures and the third digit specifies the number of zeros to follow; i.e. 103 indicates 10,000 pF. | J = ±5% (T char. only)<br>K = ±10%<br>M = ±20% |

### MARKING

|  |                                                                                                                                                                                                                                                                                            |
|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>AVX = AVX Corporation<br/>           CK = Style<br/>           31 = Case Size<br/>           B = Operating Temperature Range<br/>           T = Stability Characteristic<br/>           103 = Capacitance, Coded in pF<br/>           K = Tolerance<br/>           0505 = Date Code</p> |
|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### RATINGS & PART NUMBER REFERENCE (Standard Values)

| Military Type Designation | Capacitance (pF) | Capacitance Tolerance | WVDC |
|---------------------------|------------------|-----------------------|------|
| <b>CK31 (BT)</b>          |                  |                       |      |
| CK31BT271*                | 270              | J, K                  | 50   |
| CK31BT331                 | 330              | J, K                  | 50   |
| CK31BT391                 | 390              | J, K                  | 50   |
| CK31BT471                 | 470              | J, K                  | 50   |
| CK31BT561                 | 560              | J, K                  | 50   |
| CK31BT681                 | 680              | J, K                  | 50   |
| CK31BT821                 | 820              | J, K                  | 50   |
| CK31BT102                 | 1,000            | J, K                  | 50   |
| CK31BT122                 | 1,200            | J, K                  | 50   |
| CK31BT152                 | 1,500            | J, K                  | 50   |
| CK31BT182                 | 1,800            | J, K                  | 50   |
| CK31BT222                 | 2,200            | J, K                  | 50   |
| CK31BT272                 | 2,700            | J, K                  | 50   |
| CK31BT332                 | 3,300            | J, K                  | 50   |
| CK31BT392                 | 3,900            | J, K                  | 50   |
| CK31BT472                 | 4,700            | J, K                  | 50   |
| CK31BT562                 | 5,600            | J, K                  | 50   |
| CK31BT682                 | 6,800            | J, K                  | 50   |
| CK31BT822                 | 8,200            | J, K                  | 50   |
| CK31BT103                 | 10,000           | J, K                  | 50   |
| <b>CK31 (BU)</b>          |                  |                       |      |
| CK31BU123*                | 12,000           | K, M                  | 50   |
| CK31BU153                 | 15,000           | K, M                  | 50   |
| CK31BU183                 | 18,000           | K, M                  | 50   |
| CK31BU203                 | 20,000           | K, M                  | 50   |
| <b>CK31 (BV)</b>          |                  |                       |      |
| CK31BV223*                | 22,000           | K, M                  | 50   |
| CK31BV273                 | 27,000           | K, M                  | 50   |
| CK31BV333                 | 33,000           | K, M                  | 50   |
| CK31BV393                 | 39,000           | K, M                  | 50   |
| CK31BV473                 | 47,000           | K, M                  | 50   |
| CK31BV513                 | 51,000           | K, M                  | 50   |

Add Capacitance Tolerance Letter  
 J = ±5%, K = ±10% or M = ±20%

| Military Type Designation | Capacitance (pF) | Capacitance Tolerance | WVDC |
|---------------------------|------------------|-----------------------|------|
| <b>CK32 (BT)</b>          |                  |                       |      |
| CK32BT123*                | 12,000           | J, K                  | 50   |
| CK32BT153                 | 15,000           | J, K                  | 50   |
| CK32BT183                 | 18,000           | J, K                  | 50   |
| CK32BT203                 | 20,000           | J, K                  | 50   |
| <b>CK32 (BU)</b>          |                  |                       |      |
| CK32BU223*                | 22,000           | K, M                  | 50   |
| CK32BU273                 | 27,000           | K, M                  | 50   |
| CK32BU333                 | 33,000           | K, M                  | 50   |
| CK32BU393                 | 39,000           | K, M                  | 50   |
| <b>CK32 (BV)</b>          |                  |                       |      |
| CK32BV563*                | 56,000           | K, M                  | 50   |
| CK32BV623                 | 62,000           | K, M                  | 50   |
| CK32BV683                 | 68,000           | K, M                  | 50   |
| CK32BV753                 | 75,000           | K, M                  | 50   |
| CK32BV823                 | 82,000           | K, M                  | 50   |
| CK32BV913                 | 91,000           | K, M                  | 50   |
| CK32BV104                 | 100,000          | K, M                  | 50   |

Add Capacitance Tolerance Letter  
 J = ±5%, K = ±10% or M = ±20%

# Glass-K Capacitors

## CKR31, 32 (QPL to MIL-C-39014/21)

### Established Reliability

#### APPLICATIONS

These miniature multilayer ceramic capacitors, style CKR31 and CKR32, are qualified to Established Reliability specification MIL-C-39014/21. High volumetric efficiency and reliable performance result from the special GLASS-K dielectric, which is fused into a compact monolithic structure. These capacitors are available in three different stability characteristics.

#### PERFORMANCE CHARACTERISTICS

**Tolerance:**  $\pm 20\%$  and  $\pm 10\%$  in characteristics "U" and "V", and  $\pm 10\%$  and  $\pm 5\%$  in characteristic "T".

**Stability Characteristics:** Available as follows:

BT-TC: +2, -10%; TVC: +2, -10%

BU-TC: +2, -15%; TVC: +2, -15%

BV-TC: +20, -45%; TVC: +20, -50%

**Dissipation Factor:**

BT:  $\leq 1.0\%$

BU:  $\leq 1.5\%$

BV:  $\leq 3.0\%$

**Life:** Meets or exceeds requirements of MIL-C-39014. At 200% of rated voltage, 125°C, at 4,000 hours, the capacitance change for each stability characteristic is as follows:

BT:  $\pm 5\%$

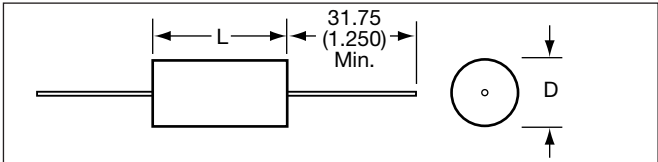
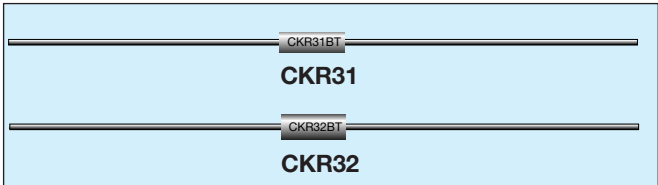
BU:  $\pm 10\%$

BV:  $\pm 20\%$

**Insulation Resistances:** At 25°C, 100,000 megohms or 1,000 megohm-microfarads. At 125°C, 10,000 megohms or 100 megohm-microfarads.

**Voltage/Temperature Ratings0:** Rated voltage is 50 Vdc. The operating temperature range is -55°C to +125°C.

**Moisture Resistance:** Meets or exceeds requirements of MIL-C-39014 and MIL-STD-202, Method 106. The capacitance change is less than 2% for stability characteristics T and U, and less than 5% for characteristic V.



#### DIMENSIONS:

millimeters (inches)

| Case Size | L<br>$\pm .254$ (0.010) | D<br>$\pm .254$ (0.010) | Lead Dia.<br>$+0.1(+0.004)$<br>$-0.03(\pm 0.001)$ | Weight<br>(Grams)<br>(Typ.) |
|-----------|-------------------------|-------------------------|---------------------------------------------------|-----------------------------|
| CKR31     | 6.09<br>(0.240)         | 2.29<br>(0.090)         | .41<br>(0.016)                                    | .2                          |
| CKR32     | 6.09<br>(0.240)         | 3.30<br>(0.130)         | .41<br>(0.016)                                    | .3                          |

**Note:** Leads are gold-plated, solderable and weldable per MIL-STD-1276, Type D.

#### QUICK SELECTION GUIDE

| Capacitance – pF | Style<br>CKR | Stability<br>Char. |
|------------------|--------------|--------------------|
| 270 – 10,000     | 31           | BT                 |
| 12,000 – 20,000  | 31<br>32     | BU<br>BT           |
| 22,000 – 39,000  | 31<br>32     | BV<br>BU           |
| 47,000 – 51,000  | 31           | BV                 |
| 56,000 – 100,000 | 32           | BV                 |

# Glass-K Capacitors

## Part Numbers and Ordering Information



### MARKING

|  |                                |
|--|--------------------------------|
|  | J = JAN Trademark              |
|  | CK = Style                     |
|  | 31 = Case Size                 |
|  | 103 = Capacitance, Coded in pF |
|  | K = Tolerance                  |
|  | M = Failure Rate Level         |
|  | 0505 = Date Code               |
|  | B = Lot Code                   |
|  | AVX = AVX Corporation          |

### Part Number Explanation

Part numbers are formed by adding a dash number from the part number table to the basic mil spec number – M39014/21 – (add dash number)

Example: M39014/21-0040

CKR31 10,000pF  $\pm 10\%$  50V

M Failure Rate (BT Characteristic)

### CROSS REFERENCE

| MIL-C-39014/21 Style | MIL-C-11015/25 Style |
|----------------------|----------------------|
| CKR31                | CK31                 |
| CKR32                | CK32                 |

### RATINGS & PART NUMBER REFERENCE

| M39014/21 (Dash Number) Failure Rate Level (%/1,000 hours) 1.0 (M) | Capacitance Value (pF) | Capacitance Tolerance $\pm$ Percent | DC Rated Voltage |
|--------------------------------------------------------------------|------------------------|-------------------------------------|------------------|
| CKR31 (BT)                                                         |                        |                                     |                  |
| 0001                                                               | 270                    | 5                                   | 50               |
| 0002                                                               | 270                    | 10                                  | 50               |
| 0003                                                               | 330                    | 5                                   | 50               |
| 0004                                                               | 330                    | 10                                  | 50               |
| 0005                                                               | 390                    | 5                                   | 50               |
| 0006                                                               | 390                    | 10                                  | 50               |
| 0007                                                               | 470                    | 5                                   | 50               |
| 0008                                                               | 470                    | 10                                  | 50               |
| 0009                                                               | 560                    | 5                                   | 50               |
| 0010                                                               | 560                    | 10                                  | 50               |
| 0011                                                               | 680                    | 5                                   | 50               |
| 0012                                                               | 680                    | 10                                  | 50               |
| 0013                                                               | 820                    | 5                                   | 50               |
| 0014                                                               | 820                    | 10                                  | 50               |
| 0015                                                               | 1,000                  | 5                                   | 50               |
| 0016                                                               | 1,000                  | 10                                  | 50               |
| 0017                                                               | 1,200                  | 5                                   | 50               |
| 0018                                                               | 1,200                  | 10                                  | 50               |
| 0019                                                               | 1,500                  | 5                                   | 50               |
| 0020                                                               | 1,500                  | 10                                  | 50               |
| 0021                                                               | 1,800                  | 5                                   | 50               |
| 0022                                                               | 1,800                  | 10                                  | 50               |
| 0023                                                               | 2,200                  | 5                                   | 50               |
| 0024                                                               | 2,200                  | 10                                  | 50               |
| 0025                                                               | 2,700                  | 5                                   | 50               |
| 0026                                                               | 2,700                  | 10                                  | 50               |
| 0027                                                               | 3,300                  | 5                                   | 50               |
| 0028                                                               | 3,300                  | 10                                  | 50               |
| 0029                                                               | 3,900                  | 5                                   | 50               |
| 0030                                                               | 3,900                  | 10                                  | 50               |
| 0031                                                               | 4,700                  | 5                                   | 50               |
| 0032                                                               | 4,700                  | 10                                  | 50               |
| 0033                                                               | 5,600                  | 5                                   | 50               |
| 0034                                                               | 5,600                  | 10                                  | 50               |
| 0035                                                               | 6,800                  | 5                                   | 50               |
| 0036                                                               | 6,800                  | 10                                  | 50               |
| 0037                                                               | 8,200                  | 5                                   | 50               |
| 0038                                                               | 8,200                  | 10                                  | 50               |
| 0039                                                               | 10,000                 | 5                                   | 50               |
| 0040                                                               | 10,000                 | 10                                  | 50               |
| CKR31 (BU)                                                         |                        |                                     |                  |
| 0041                                                               | 12,000                 | 10                                  | 50               |
| 0042                                                               | 12,000                 | 20                                  | 50               |
| 0043                                                               | 15,000                 | 10                                  | 50               |
| 0044                                                               | 15,000                 | 20                                  | 50               |
| 0045                                                               | 18,000                 | 10                                  | 50               |
| 0046                                                               | 18,000                 | 20                                  | 50               |
| 0047                                                               | 20,000                 | 10                                  | 50               |
| 0048                                                               | 20,000                 | 20                                  | 50               |

| M39014/21 (Dash Number) Failure Rate Level (%/1,000 hours) 1.0 (M) | Capacitance Value (pF) | Capacitance Tolerance $\pm$ Percent | DC Rated Voltage |
|--------------------------------------------------------------------|------------------------|-------------------------------------|------------------|
| CKR31 (BV)                                                         |                        |                                     |                  |
| 0049                                                               | 22,000                 | 10                                  | 50               |
| 0050                                                               | 22,000                 | 20                                  | 50               |
| 0051                                                               | 27,000                 | 10                                  | 50               |
| 0052                                                               | 27,000                 | 20                                  | 50               |
| 0053                                                               | 33,000                 | 10                                  | 50               |
| 0054                                                               | 33,000                 | 20                                  | 50               |
| 0055                                                               | 39,000                 | 10                                  | 50               |
| 0056                                                               | 39,000                 | 20                                  | 50               |
| 0057                                                               | 47,000                 | 10                                  | 50               |
| 0058                                                               | 47,000                 | 20                                  | 50               |
| 0059                                                               | 51,000                 | 10                                  | 50               |
| 0060                                                               | 51,000                 | 20                                  | 50               |
| CKR32 (BT)                                                         |                        |                                     |                  |
| 0061                                                               | 12,000                 | 5                                   | 50               |
| 0062                                                               | 12,000                 | 10                                  | 50               |
| 0063                                                               | 15,000                 | 5                                   | 50               |
| 0064                                                               | 15,000                 | 10                                  | 50               |
| 0065                                                               | 18,000                 | 5                                   | 50               |
| 0066                                                               | 18,000                 | 10                                  | 50               |
| 0067                                                               | 20,000                 | 5                                   | 50               |
| 0068                                                               | 20,000                 | 10                                  | 50               |
| CKR32 (BU)                                                         |                        |                                     |                  |
| 0069                                                               | 22,000                 | 10                                  | 50               |
| 0070                                                               | 22,000                 | 20                                  | 50               |
| 0071                                                               | 27,000                 | 10                                  | 50               |
| 0072                                                               | 27,000                 | 20                                  | 50               |
| 0073                                                               | 33,000                 | 10                                  | 50               |
| 0074                                                               | 33,000                 | 20                                  | 50               |
| 0075                                                               | 39,000                 | 10                                  | 50               |
| 0076                                                               | 39,000                 | 20                                  | 50               |
| CKR32 (BV)                                                         |                        |                                     |                  |
| 0077                                                               | 56,000                 | 10                                  | 50               |
| 0078                                                               | 56,000                 | 20                                  | 50               |
| 0079                                                               | 62,000                 | 10                                  | 50               |
| 0080                                                               | 62,000                 | 20                                  | 50               |
| 0081                                                               | 68,000                 | 10                                  | 50               |
| 0082                                                               | 68,000                 | 20                                  | 50               |
| 0083                                                               | 75,000                 | 10                                  | 50               |
| 0084                                                               | 75,000                 | 20                                  | 50               |
| 0085                                                               | 82,000                 | 10                                  | 50               |
| 0086                                                               | 82,000                 | 20                                  | 50               |
| 0087                                                               | 91,000                 | 10                                  | 50               |
| 0088                                                               | 91,000                 | 20                                  | 50               |
| 0089                                                               | 100,000                | 10                                  | 50               |
| 0090                                                               | 100,000                | 20                                  | 50               |

# Glass-K/ET Series Caps

## Miniature Elevated Temperature



### INTRODUCTION

Circuits that operate in environments in excess of +200°C need to be compact, reliable and efficient. Glass-K Elevated Temperature (ET) Capacitors utilize a proprietary Glass-K dielectric and are available in three different K factors which correspond to specific stability characteristics and capacitance value ranges. All Glass-K dielectrics are fused into a compact monolithic structure and transfer molded in a silicone case.

The stable performance and miniature size of these capacitors make them a natural choice for oil well logging systems, semiconductor burn-in testing, geophysical probes or anywhere temperature extremes are encountered.

### FEATURES

- Proprietary Glass-K dielectric
- Standard burn-in
- Values from 2700 pF to 100,000 pF
- Working temperature range -75°C to +200°C
- Excellent VHF characteristics

### STANDARD OPERATING CHARACTERISTICS OF AVX MINIATURE ET GLASS-K® SERIES – AXIAL LEADED GLASS CAPACITORS

|                           |                                                                                                                                                                                                                                                                                                                                    |                                                                  |
|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|
| Working Temperature Range | -75°C to 200°C                                                                                                                                                                                                                                                                                                                     |                                                                  |
| Capacitance Range         | 270 pF to 100,000 pF as follows:<br>K250...270 pF to 20,000 pF<br>K380...12,000 pF to 39,000 pF<br>K888...22,000 pF to 100,000 pF                                                                                                                                                                                                  |                                                                  |
| Insulation Resistance     | @ 25°C... $1 \times 10^{11} \Omega$<br>@ 200°C...<br>...K250... $10^8 \Omega$<br>...K380... $10^8 \Omega$<br>...K888... $10^8 \Omega$                                                                                                                                                                                              |                                                                  |
| Dissipation Factor        | @ 25°C<br>...K250...1.0%<br>...K380...1.5%<br>...K888...3.0%                                                                                                                                                                                                                                                                       | @ 200°C...<br>...K250...1.5%<br>...K380...2.5%<br>...K888...4.0% |
| Life                      | (@ 200°C, 250 hour life test at rated voltage). Post test life data as follows:<br>K250...Delta C @ 25°C<1%<br>DF @ 25°C<4%<br>IR @ 25°C> $1 \times 10^8 \Omega$<br>K380...Delta C @ 25°C<2%<br>DF @ 25°C<6%<br>IR @ 25°C> $1 \times 10^8 \Omega$<br>K888...Delta C @ 25°C<4%<br>DF @ 25°C<8%<br>IR @ 25°C> $1 \times 10^8 \Omega$ |                                                                  |

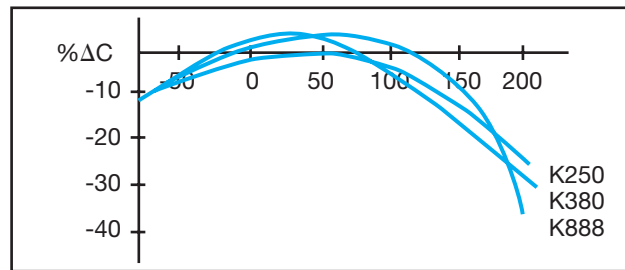
### TYPICAL APPLICATIONS

In general, AVX ET Glass-K Series glass capacitors are ideally suited for any environment where high temperature could alter or destroy circuit performance. And since they are rated down to -75°C, ET Glass-K Series capacitors are also useful where cycling to colder temperatures may be a problem. Some applications where AVX ET Glass-K Series capacitors exhibit particular advantages are:

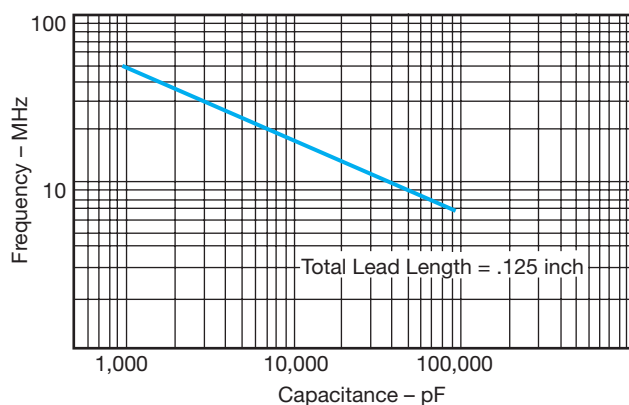
- Semiconductor Burn-in ovens.
- Oil well logging and downhole instrumentation, where frictional or geothermal heat is a problem.
- Geophysical pressure probes.
- Missile or aerospace applications where engine or environmental heat needs to be monitored or may cause circuit failure.
- Radar or other microwave applications.
- RF output circuitry where conduction or fan cooling cannot be entirely relied upon to remove all of the heat.
- Space and satellite applications where temperature changes are extreme and “zero failures” are a must.
- Industrial chemical process instrumentation where heat is a part of the process.
- Instrumentation for monitoring at-the-tool performance in metal cutting machinery.
- Fire-safe alarm or control circuitry.

# Glass-K/ET Series Caps

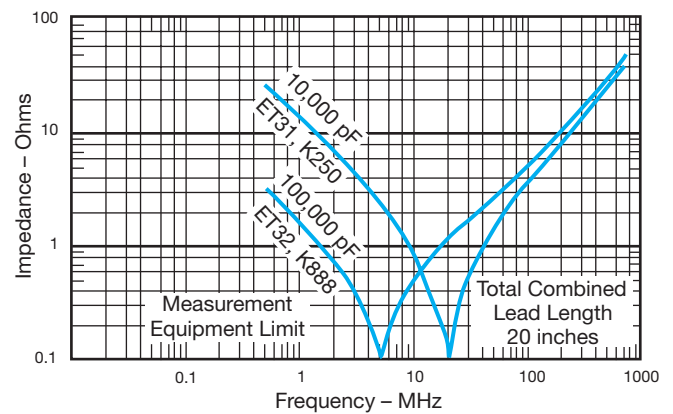
## Miniature Elevated Temperature



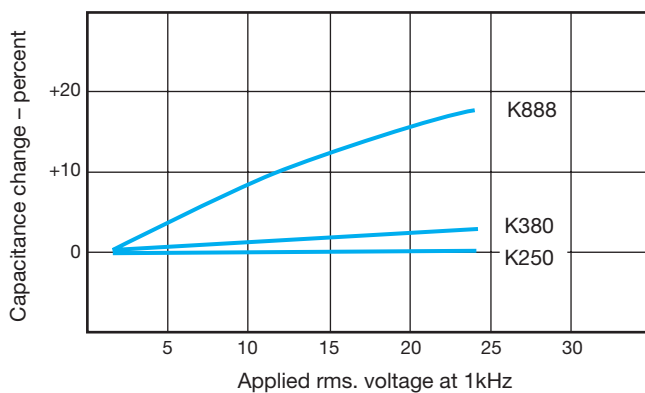
**Resonant Frequency vs. Capacitance**



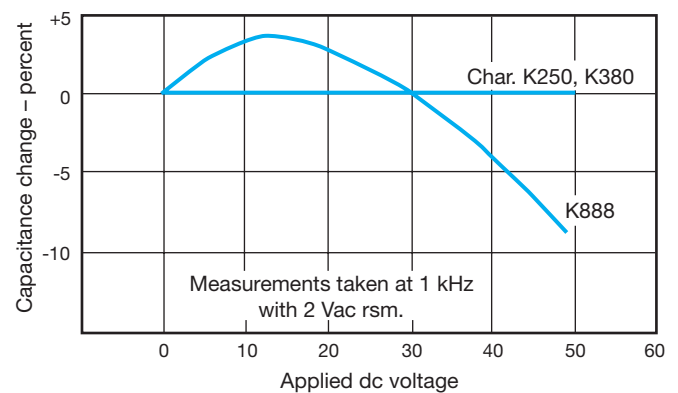
**Impedance vs. Frequency**



**% Capacitance Change vs. ac Voltage**



**% Capacitance Change vs. dc Voltage**



# Glass-K/ET Series Capacitors

## Miniature Axial Lead Elevated Temperature



### APPLICATIONS

AVX Miniature ET Glass-K capacitors are available in two standard case sizes with three different temperature coefficients. This combination provides high temperature circuit designers numerous combinations of highly volumetric efficient capacitors. All ET Glass-K capacitors are made of a proprietary nonbarium titanate dielectric and are transfer molded into a tough silicon encapsulant. ET Glass-K capacitors are internally tested to the requirements of MIL-C-39014.

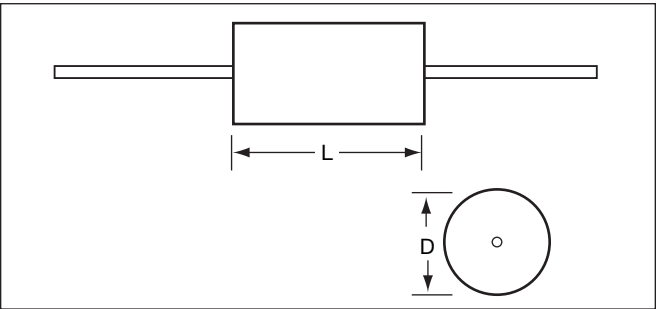
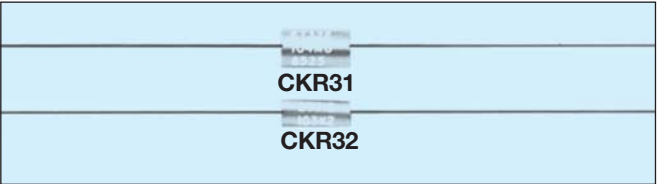
### PERFORMANCE CHARACTERISTICS

**Tolerance:** Available tolerances for each capacitance value are shown in the ordering information table on the following page. Part marking codes are also provided.

**Temperature Coefficient:** ET Glass-K capacitors are available in three different dielectric types each having a unique stability characteristic. Dielectric types and stability are as follows:

- K250: TC (+3%, -25%)
- K380: TC (+3%, -35%)
- K888: TC (+21%, -50%)

All ET Glass-K capacitors undergo a 100 hour, 100 volt burn-in prior to shipment.



### DIMENSIONS:

| Type | Case Size | Value Range            | All Dimensions in mm (inches) |              |
|------|-----------|------------------------|-------------------------------|--------------|
|      |           |                        | Length                        | Diameter     |
| ET   | 31/2      | 270 pF - 10,000 pF     | 6.10 (0.240)                  | 2.29 (0.090) |
| ET   | 31/3      | 12,000 pF - 20,000 pF  | 6.10 (0.240)                  | 2.29 (0.090) |
| ET   | 31/8      | 22,000 pF - 51,000 pF  | 6.10 (0.240)                  | 2.29 (0.090) |
| ET   | 32/2      | 12,000 pF - 20,000 pF  | 6.10 (0.240)                  | 3.30 (0.130) |
| ET   | 32/3      | 22,000 pF - 37,000 pF  | 6.10 (0.240)                  | 3.30 (0.130) |
| ET   | 32/8      | 56,000 pF - 100,000 pF | 6.10 (0.240)                  | 3.30 (0.130) |

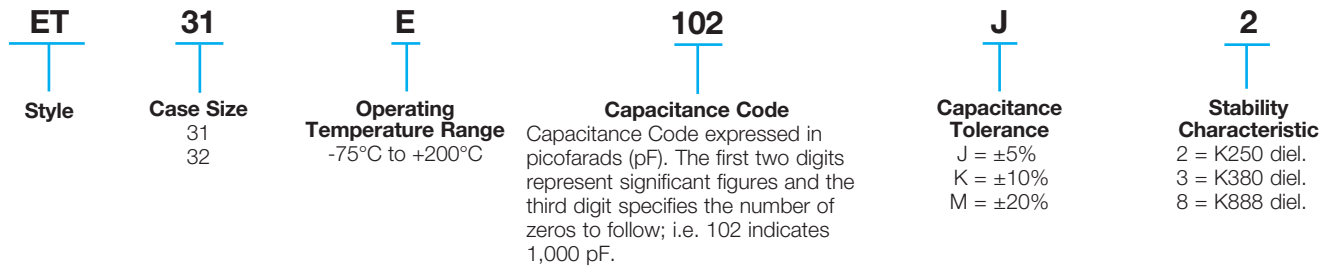
**Note:** Leads are solder-coated Dumet.

# Glass-K/ET Series Caps

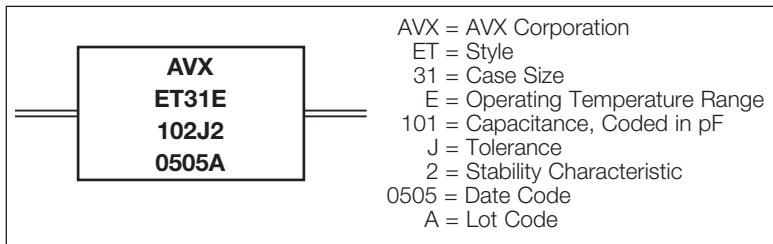
## Part Numbers and Ordering Information



### HOW TO ORDER



### MARKING



### RATINGS & PART NUMBER REFERENCE (Standard Values)

| Military Type Designation | Capacitance (pF) | Capacitance Tolerance | WVDC |
|---------------------------|------------------|-----------------------|------|
| <b>ET31</b>               |                  |                       |      |
| ET31E271_2                | 270              | J, K                  | 25   |
| ET31E331_2                | 330              | J, K                  | 25   |
| ET31E391_2                | 390              | J, K                  | 25   |
| ET31E471_2                | 470              | J, K                  | 25   |
| ET31E561_2                | 560              | J, K                  | 25   |
| ET31E681_2                | 680              | J, K                  | 25   |
| ET31E821_2                | 820              | J, K                  | 25   |
| ET31E102_2                | 1,000            | J, K                  | 25   |
| ET31E122_2                | 1,200            | J, K                  | 25   |
| ET31E152_2                | 1,500            | J, K                  | 25   |
| ET31E182_2                | 1,800            | J, K                  | 25   |
| ET31E222_2                | 2,200            | J, K                  | 25   |
| ET31E272_2                | 2,700            | J, K                  | 25   |
| ET31E332_2                | 3,300            | J, K                  | 25   |
| ET31E392_2                | 3,900            | J, K                  | 25   |
| ET31E472_2                | 4,700            | J, K                  | 25   |
| ET31E562_2                | 5,600            | J, K                  | 25   |
| ET31E682_2                | 6,800            | J, K                  | 25   |
| ET31E822_2                | 8,200            | J, K                  | 25   |
| ET31E103_2                | 10,000           | J, K                  | 25   |
| ET31E123_3                | 12,000           | K, M                  | 25   |
| ET31E153_3                | 15,000           | K, M                  | 25   |
| ET31E183_3                | 18,000           | K, M                  | 25   |
| ET31E203_3                | 20,000           | K, M                  | 25   |

— Add Capacitance Tolerance Letter  
J = ±5%, K = ±10% or M = ±20%

| Military Type Designation | Capacitance (pF) | Capacitance Tolerance | WVDC |
|---------------------------|------------------|-----------------------|------|
| <b>ET31 (cont'd)</b>      |                  |                       |      |
| ET32E223_8                | 22,000           | K, M                  | 25   |
| ET32E273_8                | 27,000           | K, M                  | 25   |
| ET32E333_8                | 33,000           | K, M                  | 25   |
| ET32E393_8                | 39,000           | K, M                  | 25   |
| ET32E473_8                | 47,000           | K, M                  | 25   |
| ET32E513_8                | 51,000           | K, M                  | 25   |
| <b>ET32</b>               |                  |                       |      |
| ET32E123_2                | 12,000           | J, K                  | 25   |
| ET32E153_2                | 15,000           | J, K                  | 25   |
| ET32E183_2                | 18,000           | J, K                  | 25   |
| ET32E203_2                | 20,000           | J, K                  | 25   |
| ET32E223_3                | 22,000           | K, M                  | 25   |
| ET32E273_3                | 27,000           | K, M                  | 25   |
| ET32E333_3                | 33,000           | K, M                  | 25   |
| ET32E393_3                | 39,000           | K, M                  | 25   |
| ET32E563_8                | 56,000           | K, M                  | 25   |
| ET32E623_8                | 62,000           | K, M                  | 25   |
| ET32E683_8                | 68,000           | K, M                  | 25   |
| ET32E753_8                | 75,000           | K, M                  | 25   |
| ET32E823_8                | 82,000           | K, M                  | 25   |
| ET32E913_8                | 91,000           | K, M                  | 25   |
| ET32E104_8                | 100,000          | K, M                  | 25   |

— Add Capacitance Tolerance Letter  
J = ±5%, K = ±10% or M = ±20%

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