



AVX

Glass Dielectric Capacitors

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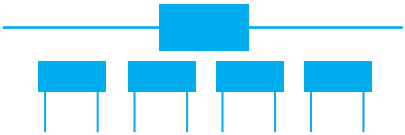
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 - Price Quotations
 - Delivery
 - Specifications of Drawing Reviews
 - Location of Franchised Distributors
 - Technical Information
 - Product Capabilities
 - Applications Assistance

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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 CYFR10-15 CYR10-15	CY06-08 CYR51-53	ET10 ET15	ET06 ET07 ET08	ET31 ET32	CK31, 32 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% CYR ±1 to 5%	TY0 ±1 to 20% CYR ±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. 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 >100pF 1MHz <100pF	.1% @ 25°C	.1%>100pF .2%<100pF	@ 25°C 1kHz: .1% @ 200°C 1kHz: 1%	@ 25°C 1kHz: <.1% @ 200°C 1kHz: <1%	1 - 3% @ 25°C 1.5 - 4% @ 200°C	1 to 3%
Insulation Resistance	Meg Ω	500,000 100,000 @25°C	100,000 @25°C	>100,000 @ 25°C >1 x 10 ⁸ Ohms @ 200°C	>100,000 @ 25°C >1 x 10 ⁸ Ohms @ 200°C	>1 x 10 ¹¹ @ 25°C >1 x 10 ⁸ Ohms @ 200°C	100,000 Meg Ω or 1000 MΩ - μF, 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) 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°C to $+200^{\circ}\text{C}$:

ET10, ET15 — Axial Leads

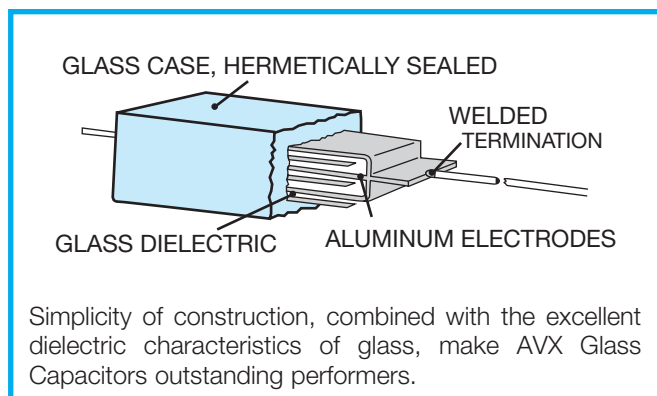
ET06, ET07, ET08 — Radial Leads

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°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°C to 125°C is no greater than 0.1% or 0.1pF, whichever is larger.

Capacitance Change vs. Temperature: Derived from the T.C. curve, ΔC 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°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°C (500,000 megohms for the CYFR series). At 125°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°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 $1500 \pm 30\text{VDC}$.

Temperature Range: The operating temperature range for all glass capacitors is -55°C to 125°C with no voltage derating required. Elevated Temperature (ET) capacitor operating temperature range -75°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°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°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).

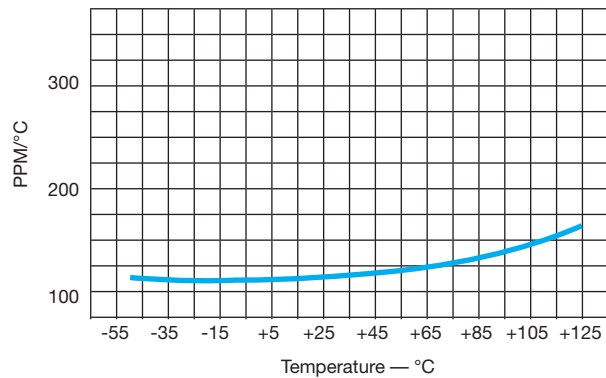
Noise: Glass dielectric capacitors have zero piezoelectric noise due to their unique dielectric material construction.

Glass Capacitors

Performance Curves

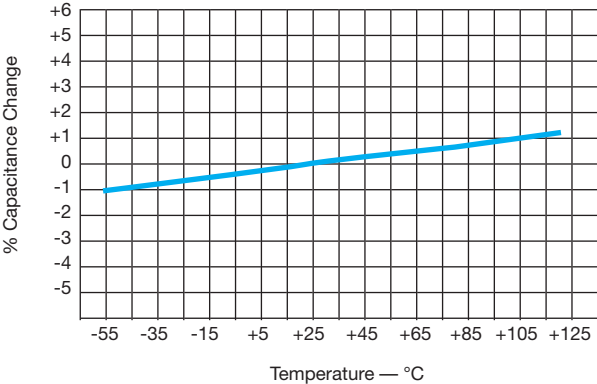


FIGURE 1



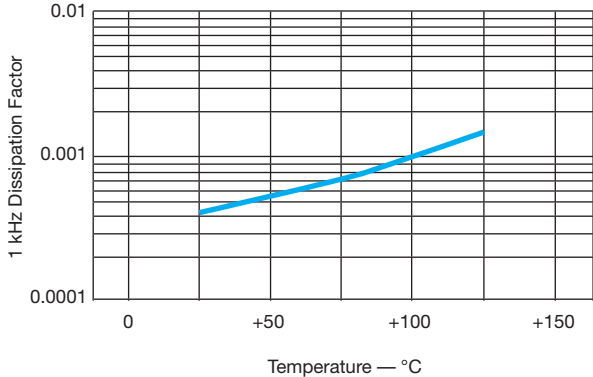
**Temperature Coefficient vs. Temperature
Radial and Axial**

FIGURE 2



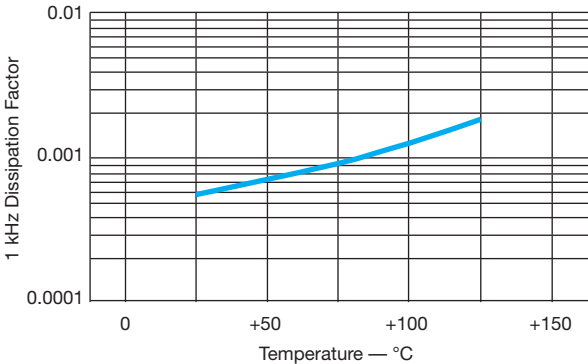
**% Capacitance Change vs. Temperature
Radial and Axial**

FIGURE 3



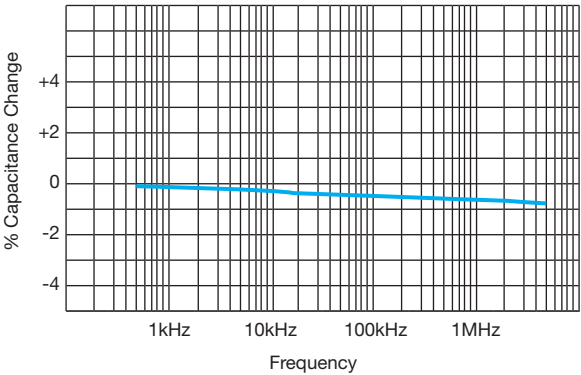
**Dissipation Factor vs. Temperature
Radial**

FIGURE 4



**Dissipation Factor vs. Temperature
Axial**

FIGURE 5



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

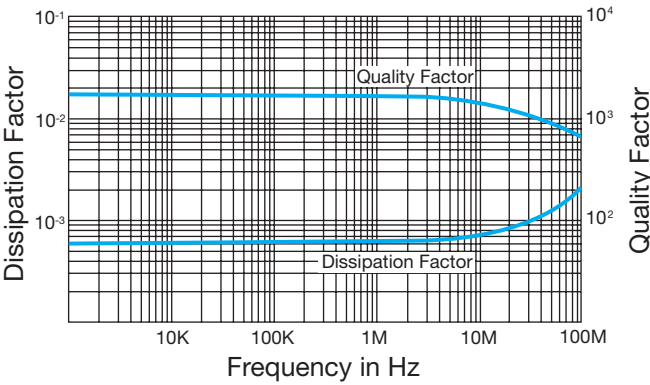


Glass Capacitors

Performance Curves

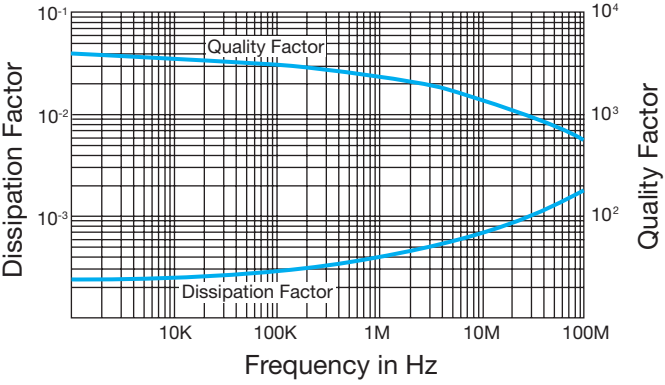


FIGURE 6



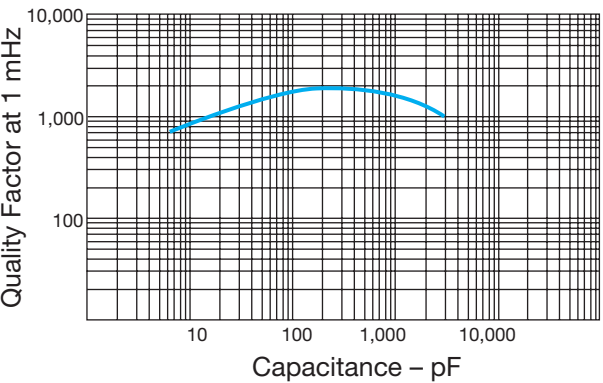
**Quality Factor and Dissipation Factor
vs. Frequency
Radial**

FIGURE 7



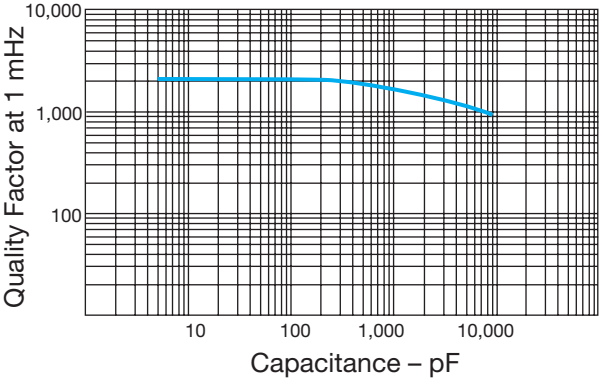
**Quality Factor and Dissipation Factor
vs. Frequency
Axial**

FIGURE 8



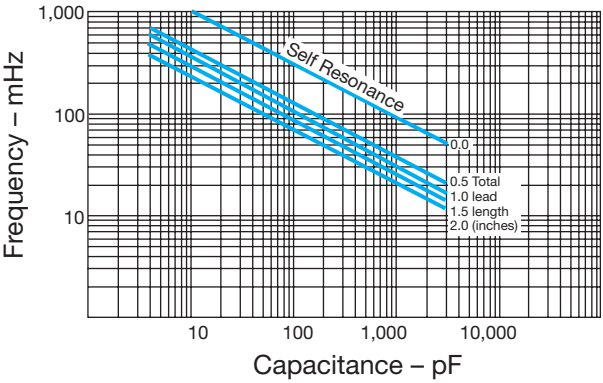
**Quality Factor vs. Capacitance
Radial**

FIGURE 9



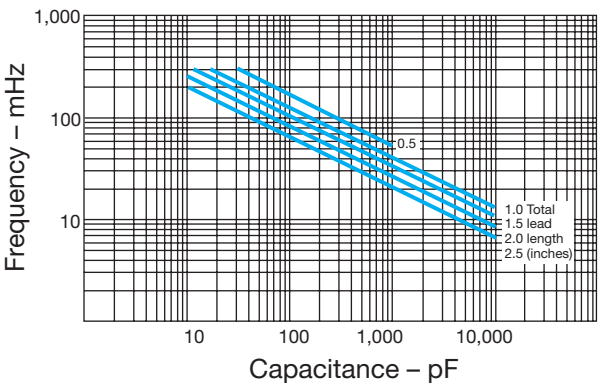
**Quality Factor vs. Capacitance
Axial**

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.

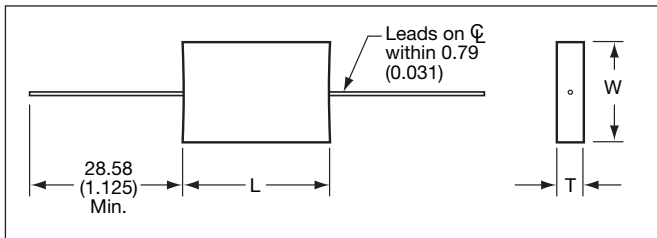
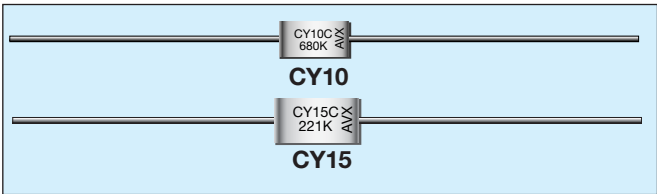
Insulation Resistance: Greater than 100,000 megohms at 25 $^{\circ}$ C; greater than 10,000 megohms at 125 $^{\circ}$ C.

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. +0.1 (+0.004) -0.03 (-0.001)	Weight (Grams)
CY10	8.74 $\pm$ 1.19 (0.344 $\pm$ 0.047)	4.37 $\pm$.79 (0.172 $\pm$ 0.031)	1.98 $\pm$.79 (0.078 $\pm$ 0.031)	.51 (0.020)	.25 - .50
CY15	11.91 $\pm$ 1.19 (0.469 $\pm$ 0.047)	6.76 $\pm$.79 (0.266 $\pm$ 0.031)	2.77 $\pm$ 1.19 (0.109 $\pm$ 0.047)	.51 (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

CY10C 101J AVX	CY = Glass Capacitor 10 = Case Size C = Operating Temperature Range 101 = Capacitance, Coded in pF J = Tolerance AVX = AVX Corporation
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RATINGS & PART NUMBER REFERENCE (Standard Values)

Military Type Designation	Cap. (pF)	Tolerances Available	DC Working Voltage
CY10			
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
CY15			
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 ± 5 ppm. Capacitance drift is less than 0.1% or 0.1pF, whichever is greater.

Voltage Coefficient: Zero.

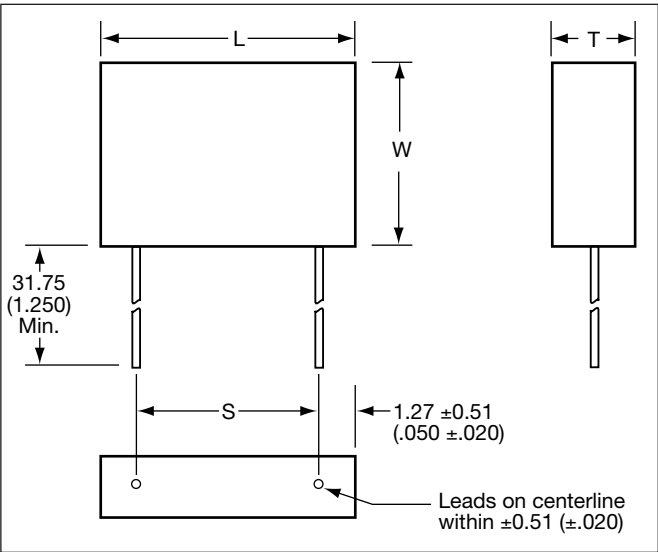
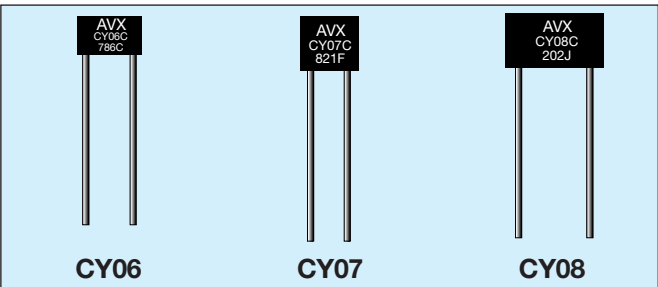
Losses: Extremely low, and remain relatively low at elevated temperatures. Dissipation factor at 1kHz and 25°C is less than 0.001 for values greater than 100pF and less than 0.002 for values of 100pF and below.

Life: After 2,000 hours at 125°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°C ; greater than 10,000 megohms at 125°C .

Voltage/Temperature Rating: 300 WVDC over the temperature range of -55°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 ± 0.13 (± 0.005)	W ± 0.25 (± 0.010)	T ± 0.13 (± 0.005)	S ± 0.51 (± 0.020)	Weight (Grams)
CY06	7.62 (0.300)	5.08 (0.200)	2.92 (0.115)	5.08 (0.200)	.3 - .4
CY07	7.62 (0.300)	7.62 (0.300)	2.92 (0.115)	5.08 (0.200)	.4 - .5
CY08	12.70 (0.500)	7.62 (0.300)	2.92 (0.115)	10.16 (0.400)	.7 - .8

Note: All leads are 24 AWG, $0.51 \pm .05$ (0.020 ± 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

AVX CY06C 561J	AVX = AVX Corporation CY = Glass Capacitor 06 = Case Size C = Operating Temperature Range 561 = Capacitance, Coded in pF J = Tolerance
---	---

RATINGS & PART NUMBER REFERENCE (Standard Values)

Military Type Designation	Capacitance (pF)	Tolerances Available	DC Working Voltage
CY06			
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
CY06 (cont)			
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
CY07			
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
CY08			
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 ± 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°C .

Life: At 2,000 hours at 125°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.

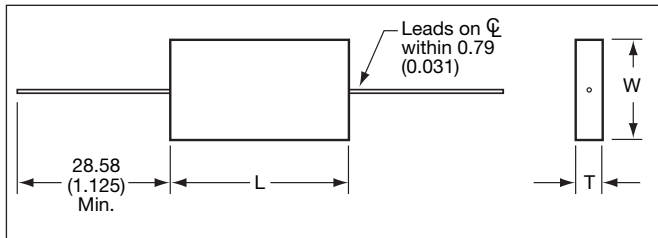
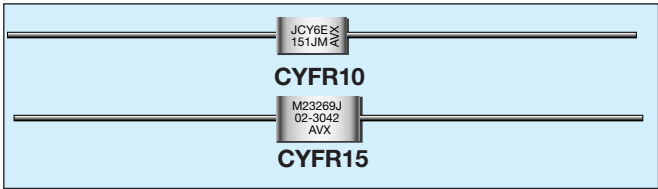
Insulation Resistance: Greater than 500,000 megohms at 25°C ; greater than 10,000 megohms at 125°C .

Voltage/Temperature Rating: Voltage ratings are shown in the ordering information table. The operating temperature range is -55°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 (H_2O) 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. $+0.1(+0.004)$ $-0.03(\pm 0.001)$	Weight (grams)
CYFR10	8.74 ± 1.19 (0.344 ± 0.047)	$4.37 \pm .79$ (0.172 ± 0.031)	$1.98 \pm .79$ (0.078 ± 0.031)	.51 (0.020)	.25 - .50
CYFR15	11.91 ± 1.19 (0.469 ± 0.047)	$6.76 \pm .79$ (0.266 ± 0.031)	2.77 ± 1.19 (0.109 ± 0.047)	.51 (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.

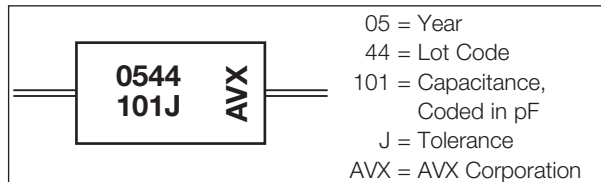
J

Capacitance Tolerance
C = ± 0.25 pF
D = ± 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
CYFR10			
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
CYFR15			
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°C to $+125^{\circ}\text{C}$. TC of all units will track and retrace to within ± 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

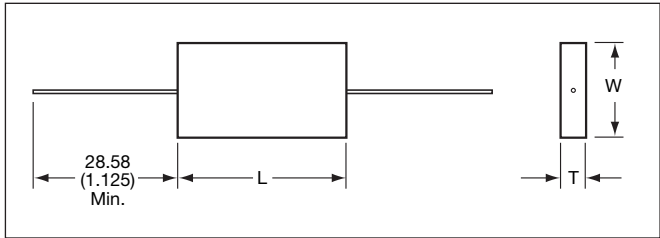
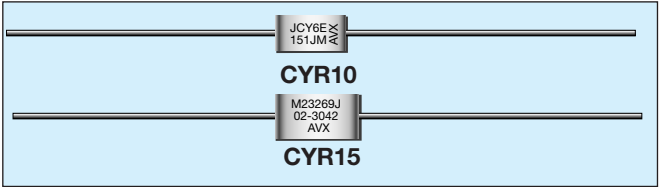
Insulation Resistance: A minimum of 100,000 megohms at 25°C and 10,000 megohms at 125°C .

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

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 (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 $\text{cm}^{-2}\text{sec}^{-1}$ 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. $+0.1(+0.004)$ $-0.03(\pm 0.001)$
CYR10	8.74 ± 1.19 (0.344 ± 0.047)	$4.37 \pm .79$ (0.172 ± 0.031)	$1.98 \pm .79$ (0.078 ± 0.031)	.51 (0.020)
CYR15	11.91 ± 1.19 (0.469 ± 0.047)	$6.76 \pm .79$ (0.266 ± 0.031)	2.77 ± 1.19 (0.109 ± 0.047)	.51 (0.020)

Note: Standard leads are solder-coated Dumet.

Glass Capacitors

Part Numbers and Ordering Information



HOW TO ORDER

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

MARKING

CYR10 JCY5A 0R5JM AVX J = JAN Trademark C = Capacitor Y = Glass Dielectric 5 = Last digit of year A = 4 week lot code OR5 = Capacitance code – OR5 = 0.5pF J = Capacitance tolerance – J = ±5%, G = ±2%, F = ±1% M = Failure level AVX = AVX Corporation	CYR15 M23269J 02-3057 AVX 05 B M23269 = Military specification established reliability glass capacitor J = JAN Trademark 02 = Case size (CYR15) 3 = Failure rate (M level) 057 = Dash Number – (capacitance in pF and capacitance tolerance) AVX = AVX Corporation 05 = Year B = Lot Code
--	---

RATINGS & PART NUMBER REFERENCE

Cap. Value (pF)	Part Number* 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 (pF)	Part Number* 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 ± 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:

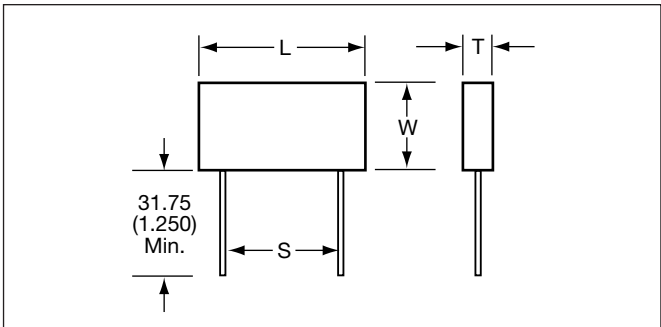
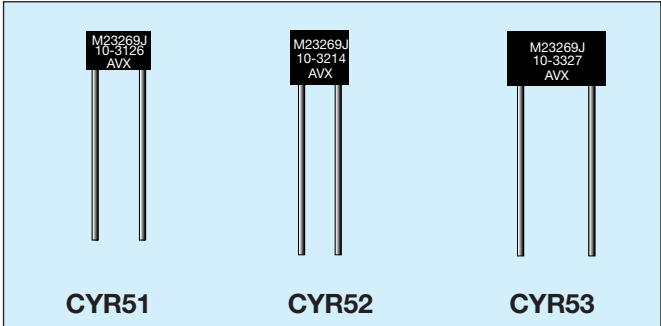
- $\pm 0.5\%$ after 2,000 hours
- $\pm 2.0\%$ after 6,000 hours

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 ± 0.13 (± 0.005)	W ± 0.25 (± 0.010)	T ± 0.13 (± 0.005)	S ± 0.51 (± 0.020)	Lead Dia. ± 0.051 (± 0.002)
CYR51	7.62 (0.300)	5.08 (0.200)	2.92 (0.115)	5.08 (0.200)	.51 (0.020)
CYR52	7.62 (0.300)	7.62 (0.300)	2.92 (0.115)	5.08 (0.200)	.51 (0.020)
CYR53	12.70 (0.500)	7.62 (0.300)	2.92 (0.115)	10.16 (0.400)	.51 (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

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

MARKING

CYR51, 52, 53	M23269 = Military specification established reliability glass capacitor J = JAN Trademark 10 = Slash sheet for case sizes – CYR51, CYR52, CYR53 3 = Failure rate (M level) 001 = Capacitance value coded in accordance with MIL-C-23269 AVX = AVX Corporation 05 = Year B = Lot Code
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M23269J
10-3001
AVX 05 B

CROSS REFERENCE

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

RATINGS & PART NUMBER REFERENCE

Cap. Value (pF)		Part Number 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 (pF)	Part Number 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 (pF)	Part Number 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 @ 200°C > 100 Megohms
Dissipation Factor	@ 25°C < .1% at 1kHz @ 200°C < 1% at 1kHz
Life	(1000 hours at rated voltage at 200°C) Post Test Delta C @ 25°C < 2% DF @ 25°C < 2.5% IR > 100 Megohms (axials) IR > 10 Megohms (radials)
Short Time (1 Hour) Exposure to Overtemperature (250°C)	No degradation
Voltage Coefficient	0

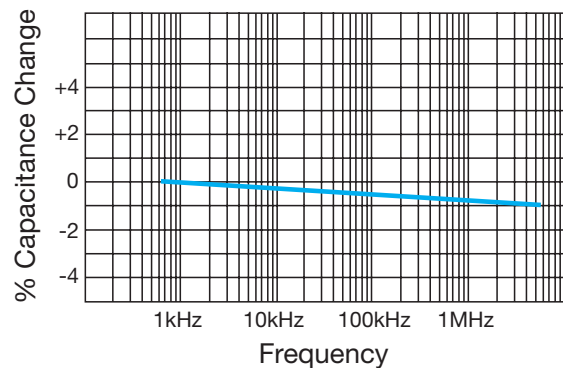
TYPICAL APPLICATIONS

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:

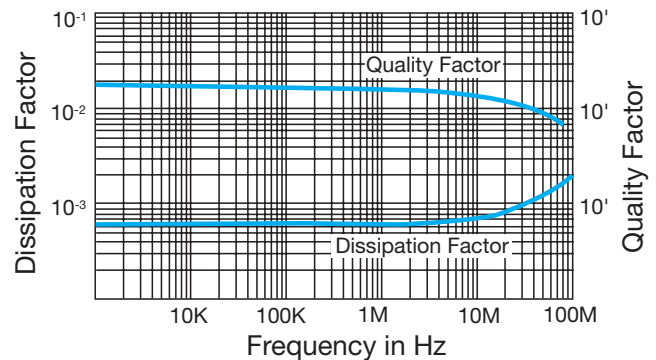
- Oil, well logging and downhole instrumentation, where frictional or geothermal heat is a problem.
- Geophysical pressure probes.
- Missile or aerospace applications where engine or environmental heat needs to be monitored or may cause circuit failure.
- Radar or other microwave applications.
- RF output 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

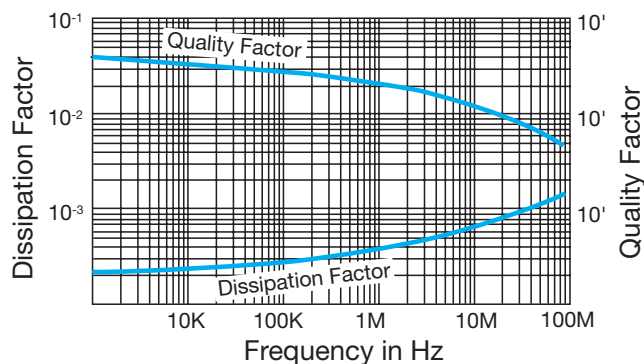
Performance Curves



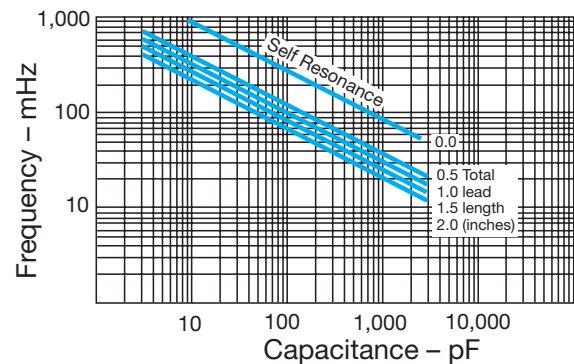
**% Capacitance Change vs. Frequency
Radial and Axial**



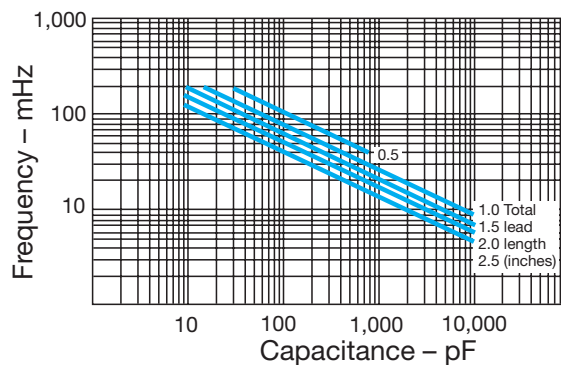
**Quality Factor and Dissipation Factor vs. Frequency
Radial**



**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.

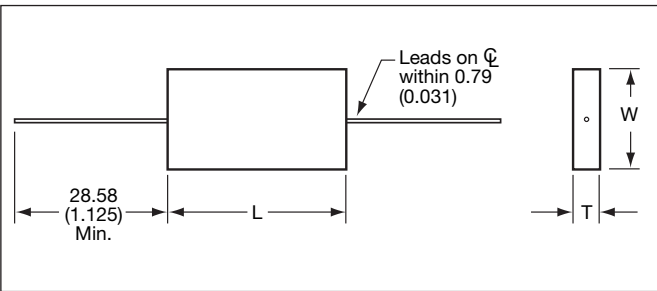
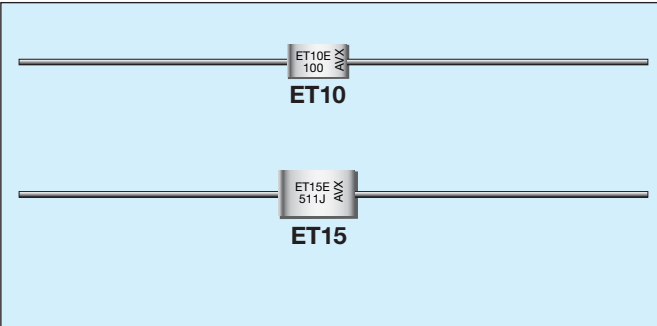
Voltage/Temperature Rating: All ET-Series capacitors are rated at 50 VDC over their operating temperature range of -75°C to 200°C. No derating is required.

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. +0.1 (+0.004) -0.03 (-0.001)	Weight (grams)
ET10	8.74 ± 1.19 (0.344 ± 0.047)	4.37 ± 0.79 (0.172 ± 0.031)	1.98 ± 0.79 (0.078 ± 0.031)	5.08 (0.200)	.25 - .50
ET15	11.91 ± 1.19 (0.469 ± 0.047)	6.76 ± 0.79 (0.266 ± 0.031)	2.77 ± 1.19 (0.109 ± 0.047)	5.08 (0.200)	.75 - 1.25

Note: Standard leads are solder-coated Dumet.

MARKING

Front	Back
ET = Glass Capacitor ETR = Glass Capacitor with “burn in” 10 = Case Size E = Operating Temperature Range	101 = Capacitance, Coded in pF J = Tolerance AVX = AVX Corporation 0505 = Date Code

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



Glass/ET Series Caps

Part Numbers and Ordering Information



HOW TO ORDER

ET	10	E	101	J
Style Glass Capacitor	Case Size 10 15	Operating Temperature Range -75°C to +200°C	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.	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
ET10, ETR10				
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
ET10, ETR10 (cont'd)				
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
ET15, ETR15				
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

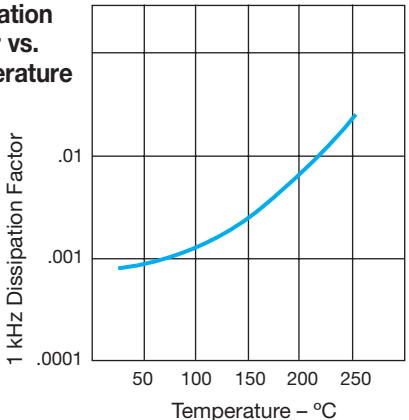
Add letter for tolerance code above lines.

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

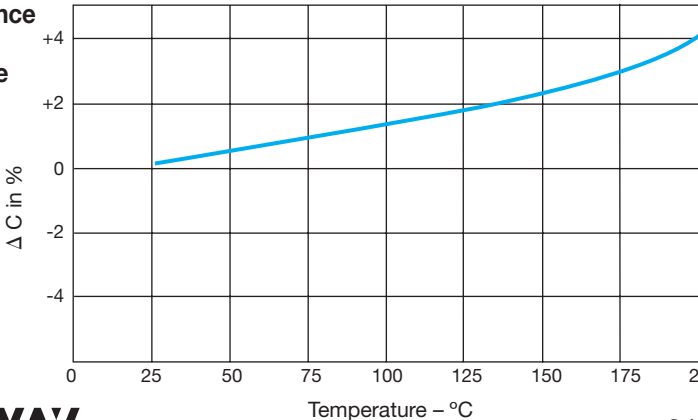
Add letter for tolerance code above lines.

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 lead 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.

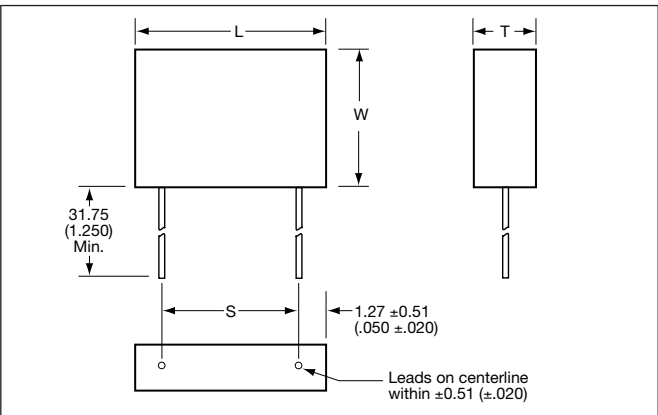
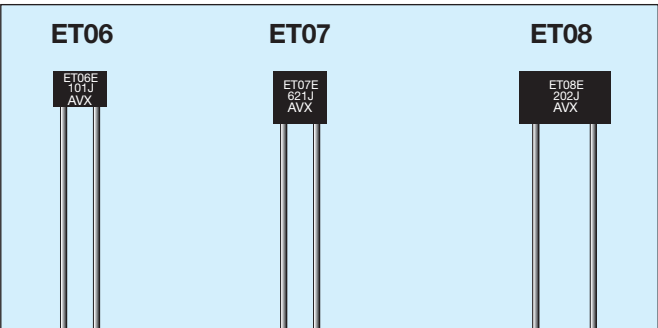
Insulation Resistance: 100,000 megohms or greater at 25°C; 100 megohms or greater at 200°C. More than 10 megohms after 1000 hour life-test.

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 lead 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.

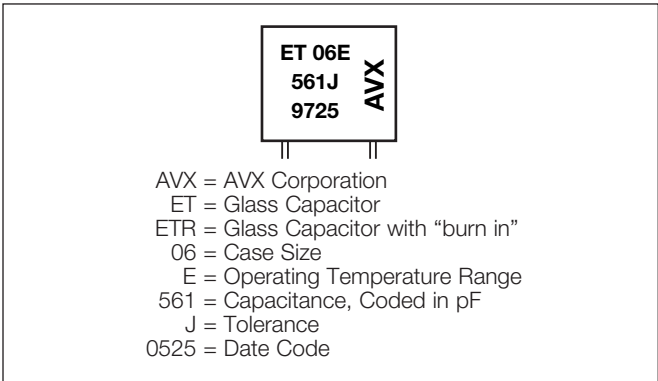


DIMENSIONS:

Case Size	L ±0.13 (±0.005)	W ±0.25 (±0.010)	T ±0.13 (±0.005)	S +0.51 (±0.020)	Weight (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
ET06, ETR06				
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.

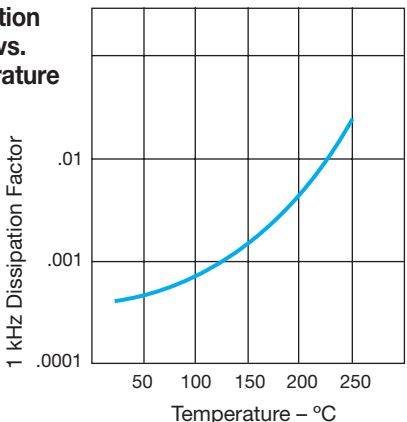
These capacitors include a "burn in", see page 22 High Voltage Stabilization Screening.

ET Part No.	ETR Part No.	Cap (pF)	Tolerances Available Voltage	DC Working
ET06, ETR06 (cont'd)				
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
ET07, ETR07				
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
ET08, ETR08				
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

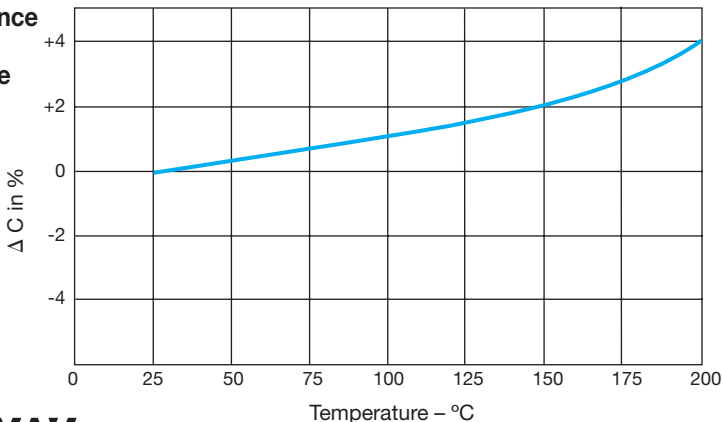
Add letter for tolerance code above lines.

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 ceraming 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 CK31, CK32	Qualified to MIL-C-11015/25, standard military specification and used in industrial applications.
Product style CKR31, CKR32	Qualified to MIL-C-39014/21, established reliability specification and also used in high reliability commercial applications.
Product style 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 ⁸ Ω
K380 Dielectric:	1 x 10 ⁸ Ω
K888 Dielectric:	1 x 10 ⁸ 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

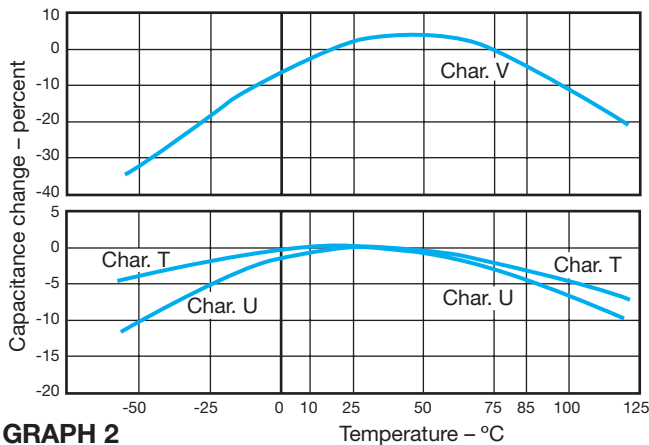
Glass-K Capacitors

Performance Curves



GRAPH 1

% Capacitance Change vs. Temperature

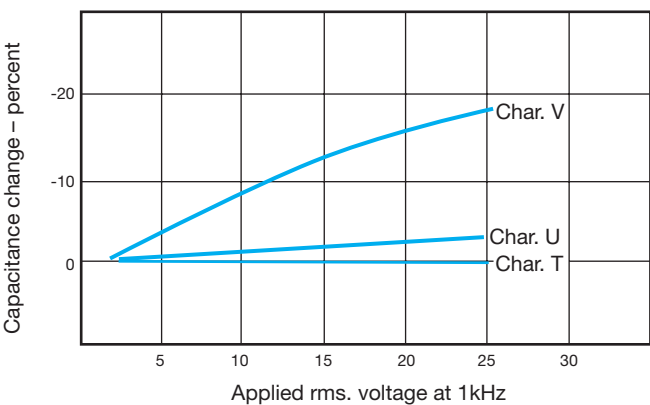


GRAPH 2

Temperature – °C

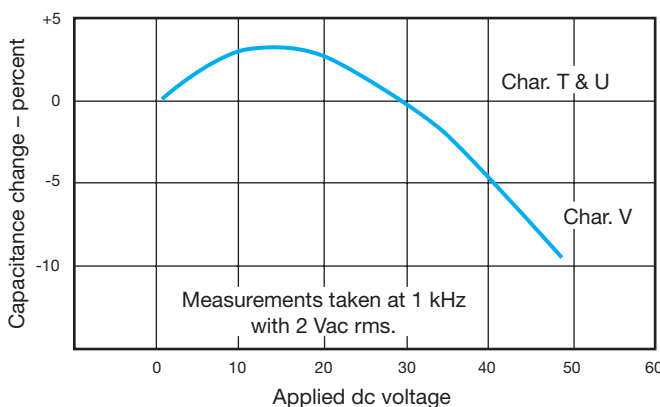
GRAPH 3

% Capacitance Change vs. ac Voltage



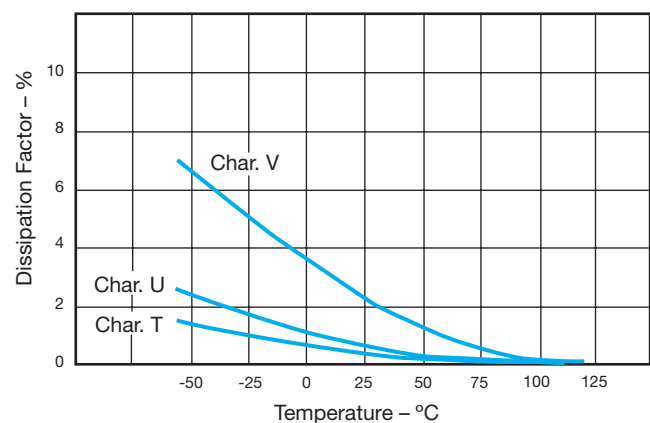
GRAPH 4

% Capacitance Change vs. dc Voltage



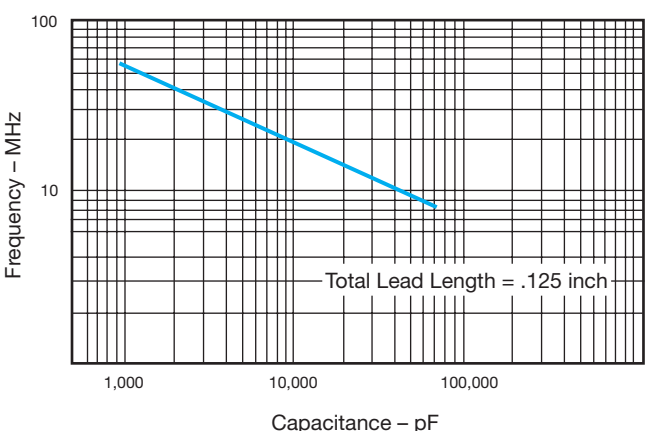
GRAPH 5

Dissipation Factor vs. Temperature



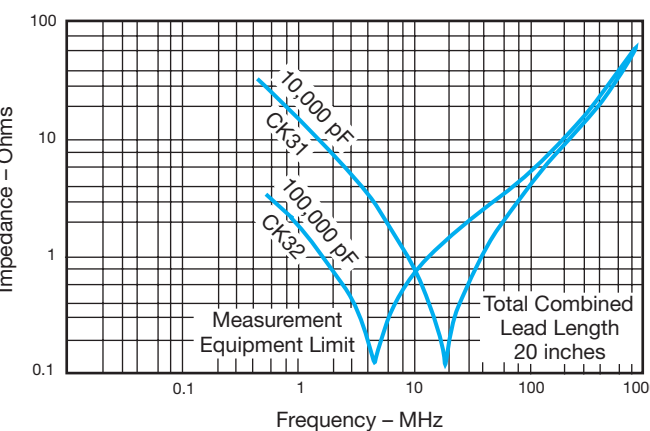
GRAPH 6

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: $\pm 2\%$

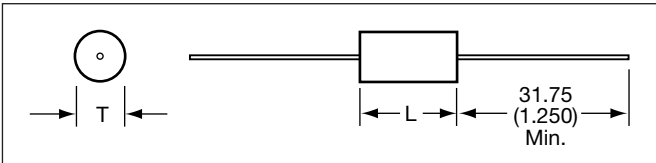
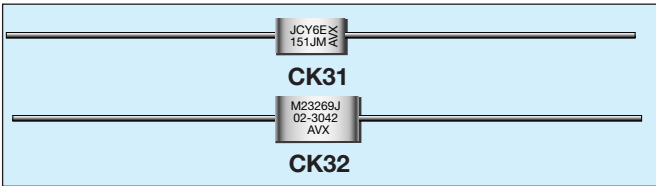
BU: $\pm 5\%$

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 $\pm .254$ (0.010)	D $\pm .254$ (0.010)	Lead Dia. $+0.1(+0.004)$ $-0.03(\pm 0.001)$	Weight (Grams) (Typ.)
CK31	6.09 (0.240)	2.29 (0.090)	.41 (0.016)	.2
CK32	6.09 (0.240)	3.30 (0.130)	.41 (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 32	BU BT
22,000 – 39,000	31 32	BV BU
47,000 – 51,000	31	BV
56,000 – 100,000	32	BV

Glass-K Capacitors

Part Numbers and Ordering Information



HOW TO ORDER

CK	31	B	T	103	K
Style	Case Size	Operating Temperature Range	Stability Characteristic	Capacitance Code	Capacitance Tolerance
	31 32	-55°C to +125°C	T = +2% -10% U = +2% -15% 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) K = ±10% M = ±20%

MARKING

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

RATINGS & PART NUMBER REFERENCE (Standard Values)

Military Type Designation	Capacitance (pF)	Capacitance Tolerance	WVDC
CK31 (BT)			
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
CK31 (BU)			
CK31BU123*	12,000	K, M	50
CK31BU153	15,000	K, M	50
CK31BU183	18,000	K, M	50
CK31BU203	20,000	K, M	50
CK31 (BV)			
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
CK32 (BT)			
CK32BT123*	12,000	J, K	50
CK32BT153	15,000	J, K	50
CK32BT183	18,000	J, K	50
CK32BT203	20,000	J, K	50
CK32 (BU)			
CK32BU223*	22,000	K, M	50
CK32BU273	27,000	K, M	50
CK32BU333	33,000	K, M	50
CK32BU393	39,000	K, M	50
CK32 (BV)			
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: $\pm 5\%$

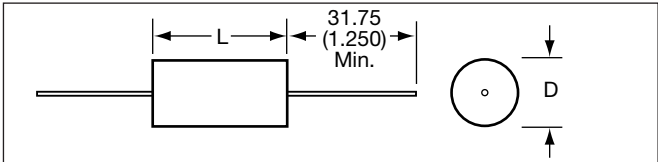
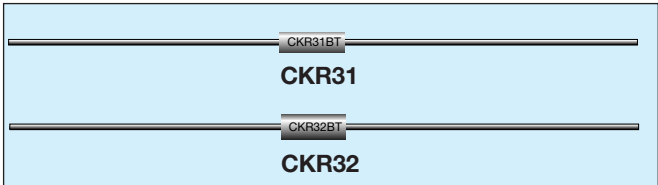
BU: $\pm 10\%$

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

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

QUICK SELECTION GUIDE

Capacitance – pF	Style CKR	Stability Char.
270 – 10,000	31	BT
12,000 – 20,000	31 32	BU BT
22,000 – 39,000	31 32	BV 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 ±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 ± 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 ± 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: K250...270 pF to 20,000 pF K380...12,000 pF to 39,000 pF K888...22,000 pF to 100,000 pF	
Insulation Resistance	@ 25°C... $1 \times 10^{11} \Omega$ @ 200°C... ...K250... $10^8 \Omega$...K380... $10^8 \Omega$...K888... $10^8 \Omega$	
Dissipation Factor	@ 25°C ...K250...1.0% ...K380...1.5% ...K888...3.0%	@ 200°C... ...K250...1.5% ...K380...2.5% ...K888...4.0%
Life	(@ 200°C, 250 hour life test at rated voltage). Post test life data as follows: K250...Delta C @ 25°C<1% DF @ 25°C<4% IR @ 25°C> $1 \times 10^8 \Omega$ K380...Delta C @ 25°C<2% DF @ 25°C<6% IR @ 25°C> $1 \times 10^8 \Omega$ K888...Delta C @ 25°C<4% DF @ 25°C<8% IR @ 25°C> $1 \times 10^8 \Omega$	

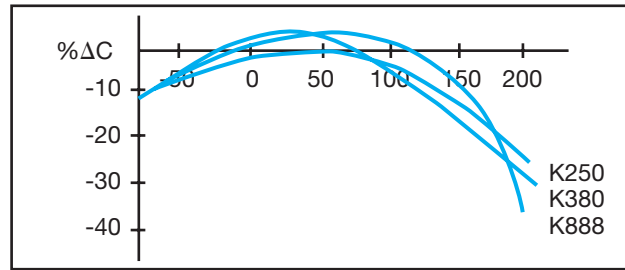
TYPICAL APPLICATIONS

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:

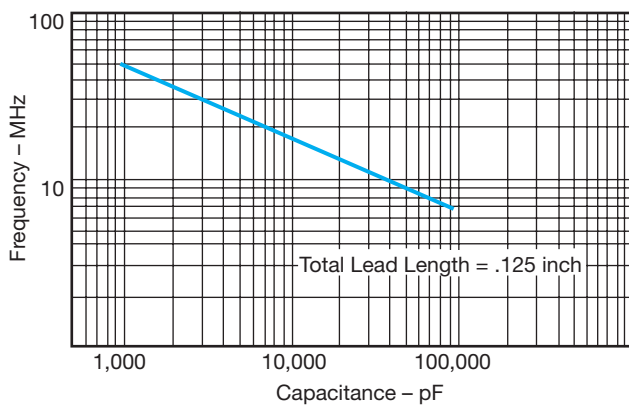
- Semiconductor Burn-in ovens.
- Oil well logging and downhole instrumentation, where frictional or geothermal heat is a problem.
- Geophysical pressure probes.
- Missile or aerospace applications where engine or environmental heat needs to be monitored or may cause circuit failure.
- Radar or other 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

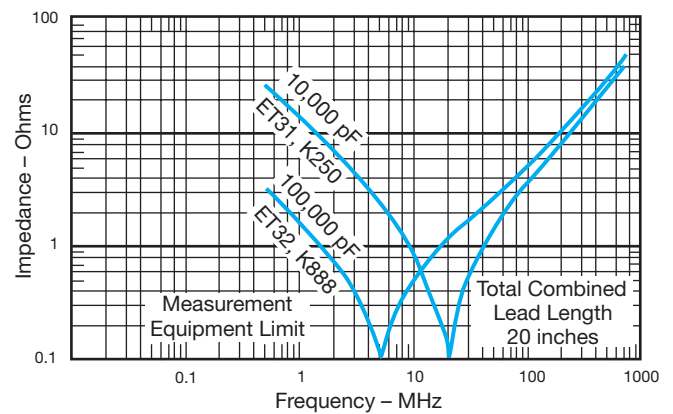
Miniature Elevated Temperature



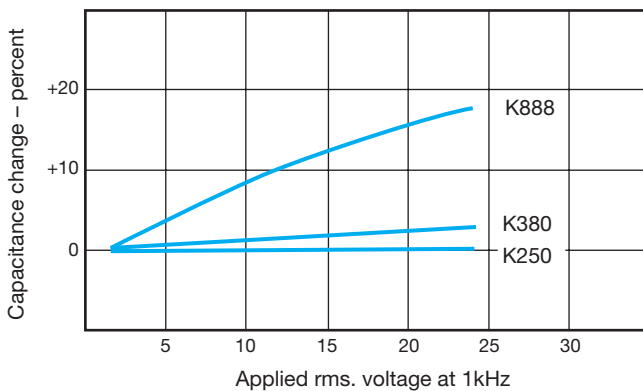
Resonant Frequency vs. Capacitance



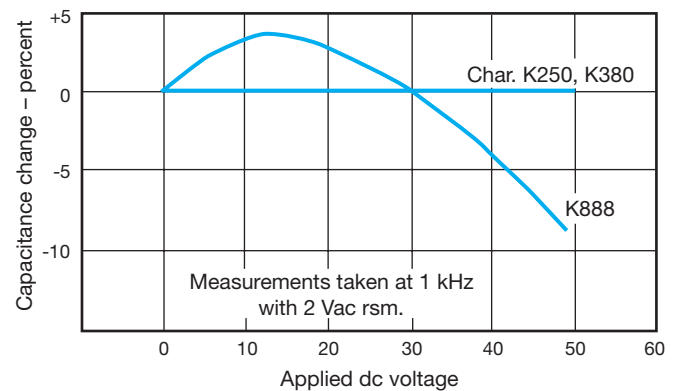
Impedance vs. Frequency



% 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.

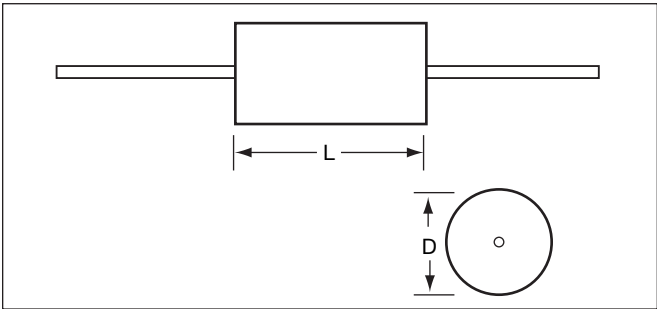
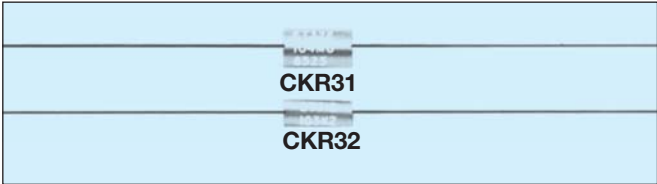
PERFORMANCE CHARACTERISTICS

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)

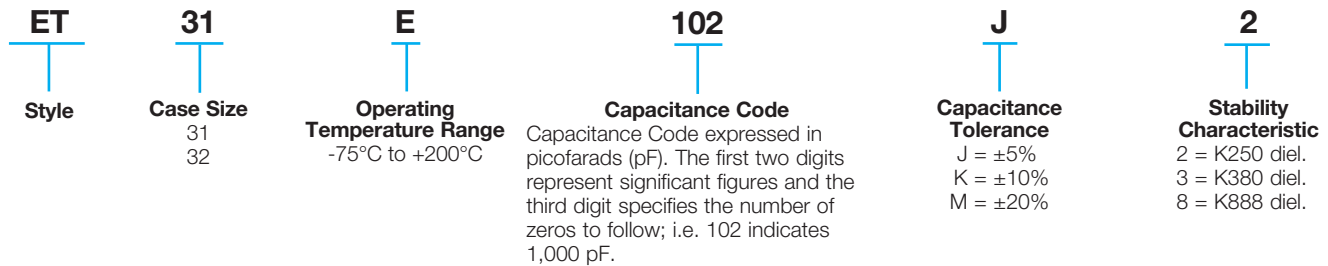
Note: Leads are solder-coated Dumet.

Glass-K/ET Series Caps

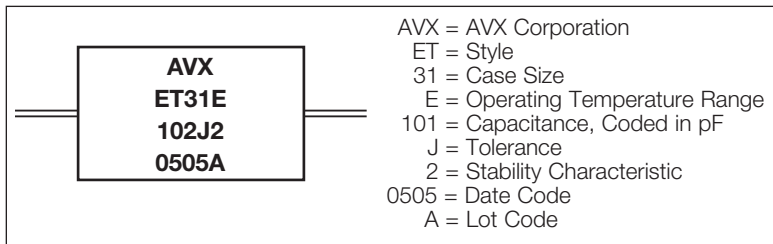
Part Numbers and Ordering Information



HOW TO ORDER



MARKING



RATINGS & PART NUMBER REFERENCE (Standard Values)

Military Type Designation	Capacitance (pF)	Capacitance Tolerance	WVDC
ET31			
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
ET31 (cont'd)			
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
ET32			
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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