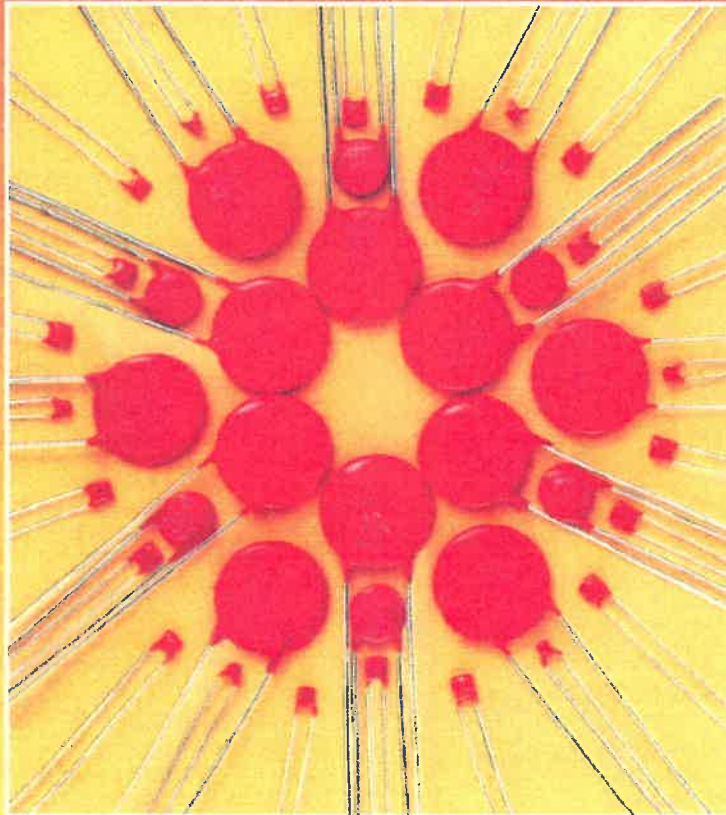


TUSONIX

Catalog 800



Ceramic Fixed Capacitors

1.0 MECHANICAL

- 1.1 Case: Conformal coated.
- 1.2 Lead Material: Copper clad steel.
- 1.3 Terminal Strength: Mil-Std-202, Method 211, Condition A (radial).
2 lbs. TUSONIX style 8121 and smaller.
5 lbs. TUSONIX style 8131 and larger.
- 1.4 Standard Unit Marking:
8121 and smaller: Capacitance (EIA color code)
8131 and larger: Trademark, Capacitance, Tolerance, TC and Voltage (stamped)

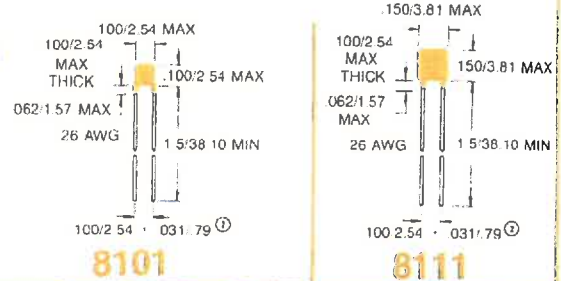
2.0 ELECTRICAL

- 2.1 Capacitance:
TC bodies, 1 MHz for values up through 1000 pF.
1KHz for values greater than 1000 pF.
Stable and General Purpose, 1 KHz for all values.
Measuring voltage shall be 1.0 Vrms or less
 - 2.2 Working Voltage: Per tables.
 - 2.3 Capacitance Tolerance: Per table. For nonstandard tolerances or tolerances applicable to capacitance values less than 10 pF, refer to page 17, Figure 4.
 - 2.4 DF: Stable 2.5%, General Purpose 3%.
Q: TC and Extended TC, per Figure 1, page 17.
 - 2.5 Insulation Resistance (at 25°C after 2 minutes electrification time at rated voltage)
TC and Stable Types — 1000 megohm mfd or 100K megohm, whichever is less.
Extended TC Types — 1000 megohm mfd or 50K megohm, whichever is less.
General Purpose Types — 1000 megohm mfd or 10K megohm, whichever is less.
 - 2.6 Dielectric Withstanding Voltage (Flash)
50, 100, and 200V, 300% of rated voltage for 5 seconds at 25°C with current limited to 50mA. Greater than 200V, 200%.
 - 2.7 Temperature Characteristic: Per tables on page 18.
- ## 3.0 ENVIRONMENTAL
- 3.1 Barometric Pressure: Mil-Std-202, Method 105, Condition D (100,000 ft.). 100% of rated voltage applied for 5 seconds, current limited to 50mA.
 - 3.2 Vibration: Mil-Std-202, Method 204, Condition B (10-2000 cps; 15G).
 - 3.3 Shock: Mil-Std-202, Method 213, Condition I.
 - 3.4 Thermal Shock: Mil-Std-202, Method 107, Condition A (-55°C to +85°C). Pre-test and post-test measurements are not required.
 - 3.5 Immersion Cycling: Mil-Std-202, Method 104, Condition A (tap water). Electrical measurements shall be made at least 4 hours, but not more than 24 hours, after completion of the final cycle.
Post-test limits: (25°C).
No evidence of corrosion, mechanical damage or obliteration of marking.
Insulation Resistance:
TC and Stable Types — 100 megohm mfd or 10K megohm, whichever is less.
Extended TC Types — 100 megohm mfd or 5K megohm, whichever is less.
General Purpose Types — 100 megohm mfd or 1K megohm, whichever is less.
Dielectric Withstanding Voltage (Flash): Refer to paragraph 2.6
 - 3.6 Moisture Resistance: Mil-Std-202, Method 106, 10 cycles without loading applied.
Post-test limits: Same as paragraph 3.5.
 - 3.7 Life test: 150% of rated voltage for 1000 hours with the following temperature:
TC and Stable 125°C.
Extended TC and General Purpose 85°C.
Post-test Limits: (25°C.) no evidence of mechanical damage or obliteration of marking.
Capacitance Change:
TC, less than 1% or .5 pF, whichever is greater.
Extended TC, 3% or .5 pF.
Stable, within 15% of initial.
General Purpose, within 30%.
DF and Q:
TC Types — Q per Figure 1, page 17.
Stable Types — DF 3%
General Purpose Types — DF 4%
Insulation Resistance:
TC and Stable Types — 100 megohm mfd or 10K megohm, whichever is less.
Extended TC Types — 100 megohm mfd or 5K megohm, whichever is less.
General Purpose Types — 100 megohm mfd or 1K megohm, whichever is less.
Dielectric Withstanding Voltage (Flash): Refer to paragraph 2.6

TUSONIX

WEECON® PLATE CERAMIC CAPACITORS

Temperature Compensating Types
Extended Temp. Comp. Types
Stable Types
General Purpose Types



TUSONIX STYLE

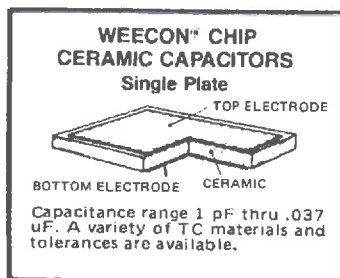
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Weecon Temperature Compensating Ceramic Capacitors are ideal for applications demanding precisely controlled capacitance changes with temperature variation. They are well suited for high Q circuits requiring optimum frequency stability and have excellent retrace characteristics. Extended Temperature Compensating Weecons are indicated where large controlled capacitance change with temperature variation is a factor. For applications where volumetric efficiency is of prime importance, Stable Weecons will provide higher capacitance values, in smaller packages with better reliability. Tusonix General Purpose Weecons are ideal for circuits requiring the utmost in volumetric efficiency at rated temperatures.

TEMP. CHAR. TABLE	
EIA Code	Temperature Range
Z5	+10°C to +85°C
Y5	+30°C to +85°C
X5	-55°C to +85°C
*X7	-55°C to +125°C
EIA Code	Maximum Cap. Change
D	+3.3%
E	-4.7%
F	±7.5%
P	±10%
R	±15%
S	±22%
T	±22% - 33%
U	±22% - 56%
V	+22% - 82%

*Formerly designated — W5.

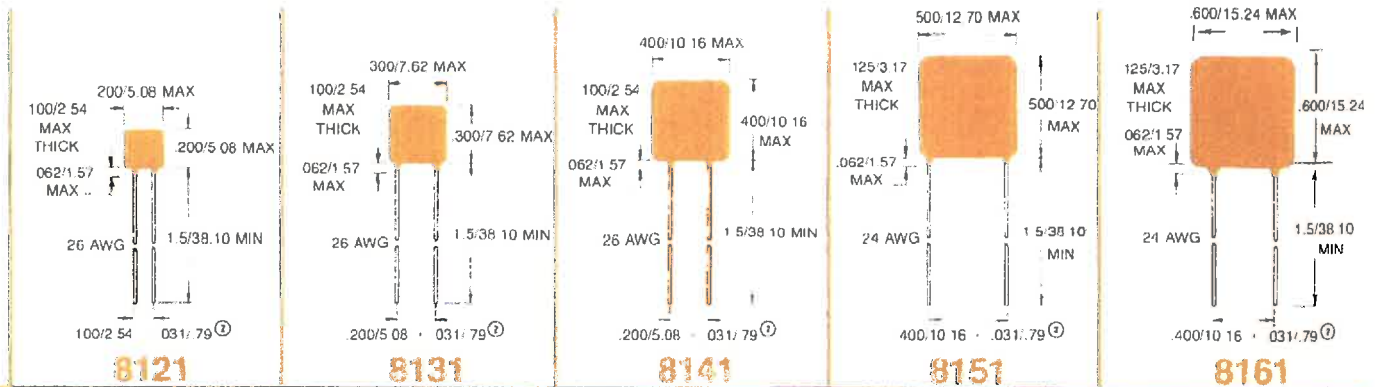


		MAXIMUM CAPACITANCE								
	EIA Code	Dielectric	Mln.* Tol.	Mln. Cap.	50/100V	200V	500V ^①	50/100V	200V	500V ^①
TEMP. COMP. TYPES	C0G	NPO	1%	1.0	20	10	N/A	51	24	11
	S1G	N0030	1%	1.6	10	5.1	N/A	27	13	5.6
	M6G	N0080	1%	1.8	12	6.2	N/A	30	15	6.2
	P2G	N0150	1%	2.2	13	6.2	N/A	33	16	6.8
	R2G	N0220	1%	2.4	13	6.8	N/A	36	18	7.5
	S2H	N0330	1%	2.7	16	8.2	N/A	43	20	8.2
	T2H	N0470	1%	3.3	18	9.1	N/A	51	24	10
	H6J	N0750	2%	4.7	24	13	N/A	68	36	13
EXTEND. TEMP. COMP. TYPES	R1N	N1500	2%	10	47	24	N/A	130	68	27
	R2N	N2200	2%	13	62	30	N/A	160	82	33
	S3B	N3300	5%	22	100	51	N/A	270	130	56
	G4C	N4200	5%	33	160	82	N/A	430	200	91
	R4D	N4700	5%	39	180	91	N/A	510	240	100
	H5M	N5600	5%	56	270	130	N/A	750	360	150
STABLE TYPES	Z50 Y5P X50 X7P	—	5%	20	100	51	N/A	270	130	51
	Z50 Y5P X50 X7P	—	5%	51	270	130	N/A	680	360	130
	Z50 Y5P X50 X7P	—	5%	62	300	160	N/A	820	390	160
	Z50 Y5P X50 X7P	—	5%	68	360	180	N/A	910	470	180
	Z50 Y5P X50 X7P	—	10%	130	680	330	N/A	1800	910	360
	Z50 Y5P X50 X7P	—	10%	150	750	390	N/A	2000	1000	390
	Z50 Y5P X50 X7P	—	20%	240	1300	620	N/A	3300	1600	680
GENERAL PURPOSE TYPES	Z50 Y5P X50 X7P	—	20%	300	1600	820	N/A	3900	2000	820

*Tolerances shown in table are minimum for 10 pF and above.

① 0.1 pF is closest tolerance available for 10 pF and less. Refer to Figure 4, page 17 for EIA tolerance.

inches	inches/mm
mm	



MAXIMUM CAPACITANCE

50/100V	200V	500V ⁽¹⁾	50/100V	200V	500V ⁽¹⁾	50/100V	200V	500V ⁽¹⁾	50/100V	200V	500V ⁽¹⁾	50/100V	200V	500V ⁽¹⁾
100	51	20	240	120	47	430	220	91	680	360	130	1000	510	200
51	24	11	130	62	24	220	110	47	360	180	75	510	270	110
56	27	12	130	68	27	240	130	51	390	200	82	620	300	120
62	30	13	160	75	30	270	130	56	430	220	91	680	330	130
68	36	13	160	82	33	300	150	62	510	240	100	750	360	150
82	39	16	200	100	39	360	180	68	560	270	110	820	390	160
91	47	18	220	110	43	390	200	82	620	330	130	910	470	180
130	68	27	300	150	62	560	300	110	910	470	180	1300	620	270
240	120	51	560	300	110	1000	510	220	1600	820	330	2400	1200	510
300	150	62	750	360	150	1300	680	270	2000	1000	430	3000	1500	620
560	270	110	1200	680	270	2200	1100	510	3600	1800	750	5600	2700	1100
820	390	160	1800	910	390	3300	1600	750	5600	2700	1200	8200	3900	1600
910	470	200	2200	1100	430	3900	2000	820	6200	3000	1300	10,000	4700	2000
1300	680	270	3300	1600	680	5600	2700	1200	9100	4700	1800	12,000	6200	2700
510	270	100	1200	620	240	2200	1100	470	3600	1800	750	5100	2400	1000
1300	620	270	3000	1500	620	5600	2700	1100	9100	4700	1800	13,000	6800	2400
1600	820	300	3600	1800	750	6800	3300	1300	10,000	5100	2200	16,000	8200	3300
1800	910	360	4300	2000	820	7500	3900	1500	12,000	6200	2400	18,000	9100	3600
3300	1600	680	7500	3900	1500	15,000	7500	3000	24,000	12,000	4700	33,000	16,000	6800
3900	1800	750	9100	4300	1800	16,000	8200	3300	27,000	13,000	5100	39,000	20,000	8200
6800	3300	1300	15,000	7500	3000	27,000	13,000	5600	47,000	22,000	9100	68,000	33,000	12,000
10,000	3900	1600	18,000	9100	3600	36,000	18,000	6800	56,000	27,000	10,000	82,000	39,000	16,000

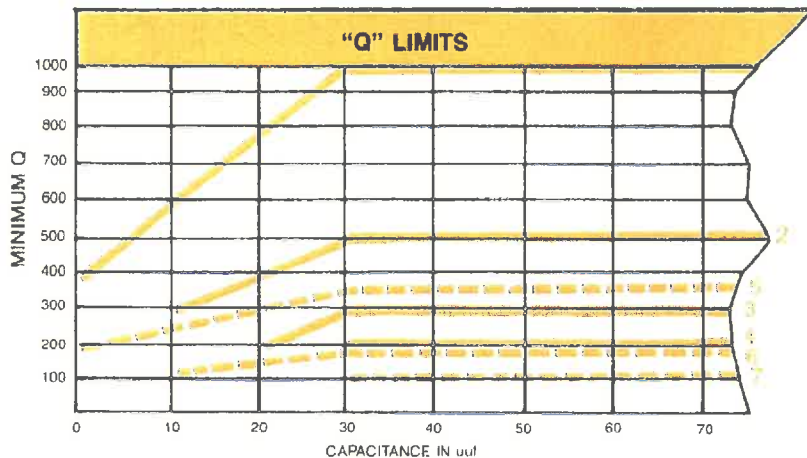
MARKING: Refer to page 14, paragraph 1.4.

NOTES: (1) When ordering 500 Volt parts, allow additional .050" thickness.
 (2) Other lead spacings and wire diameter available upon request

TO ORDER — Specify Tusonix Style, Voltage, T.C. Code, Capacitance and Tolerance. Example: 8101-200-25U-620.±20%
 e-mail: sales@tusonix.com
 For more data, call 520-744-0400.

TUSONIX DESIGN SPECIFICATIONS

FIGURE 1



- Curve 1 — Initial Q for temperature coefficients NPO thru N1500
- Curve 2 — Initial Q for N2200
- Curve 3 — Initial Q for N3300 and N4200
- Curve 4 — Initial Q for N4700 and N5600
- Curve 5 — Q after life test for temperature coefficients NPO thru N1500
- Curve 6 — Q after life test for N2200
- Curve 7 — Q after life test for N3300 thru N5600.

FIGURE 2

Temperature Coefficient	CAPACITANCE		
	.4 to 2 pF	2.1 to 3.9 pF	4 to 9.9 pF
NPO thru N330	+250 K	±120 J	±60 H
N470 thru N750	+250 K	±120 J	+120 J
N1500 and up	Not available in less than 10 pF		

TEMPERATURE CHARACTERISTICS

Standard EIA code symbols (Fig. 3) are used in this catalog for stable and general purpose capacitors. These express the maximum permissible change in capacitance in % over the specified temperature range using the 25°C measurement as a reference. In general, parts supplied to a specific characteristic will change less than the maximum.

Temperature coefficients for temperature compensating capacitors indicate the nominal change in capacitance between +25°C and +85°C or -125°C expressed in parts per million per degree centigrade.

FIGURE 3

TEMP. CHAR. TABLE	
EIA Code	Temperature Range
Z5	+10°C to +85°C
Y5	30°C to +85°C
X5	55°C to +85°C
X7	55°C to +125°C
EIA Code	Maximum Cap. Change
D	±3.3%
E	+4.7%
F	±7.5%
P	+10%
R	+15%
S	+22%
T	+22% - 33%
U	+22% - 56%
V	-22% 82%

*Formerly designated — W5.

FIGURE 4

CAPACITANCE TOLERANCE TABLE		
Nominal Capacitance 10 pF or Less	Code	Nominal Capacitance over 10 pF and all Resistance Values
+ .1 pF	A	+ 50 - 20%
± .25 pF	B	
+ .5 pF	C	
± .3 pF	D	+ 70 - 30%
± 1 pF	E	± 1%
± 2 pF	F	± 2%
± 3%	G	+ 3%
	H	+ 60 - 40%
+ 5%	I	+ 5%
± 10%	J	± 10%
+ 2%	K	± 100 - 40%
+ 20%	L	± 20%
± 4 pF	M	± 30%
+ 2 pF	N	+ 100 - 0%
	P	± 15%
	Q	± 2.5%
	R	+ 50 - 15%
	S	+ 30 - 20%
	T	+ 80 - 0%
	U	+ 7.0%
	V	+ 50 30%
	W	+ 40 - 10%
	X	+ 50 0%
	Y	+ 80 - 20%
	Z	

TUSONIX APPLICATION AND TYPICAL CURVES

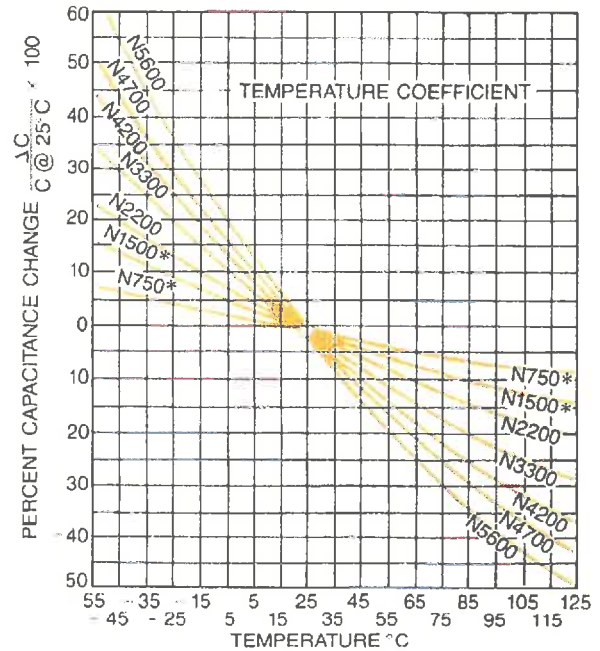
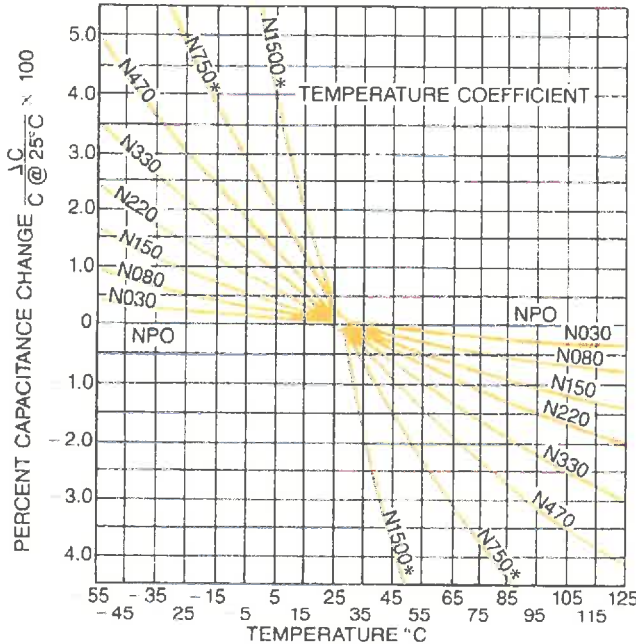
50V, 100V, 200V and 500V Ceramic Capacitors

Temperature and Extended Temperature Compensating Types

TEMPERATURE & EXTENDED TEMPERATURE COMPENSATING TYPES

The two sets of curves below indicate the change in capacitance with temperature for TUSONIX temperature compensating capacitors. It should be noted that capacitance change with temperature is not strictly linear. The nominal temperature

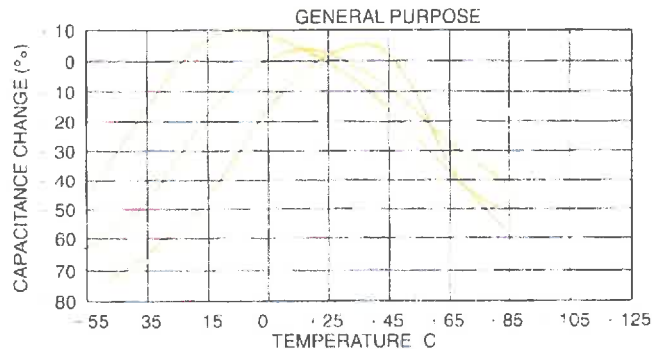
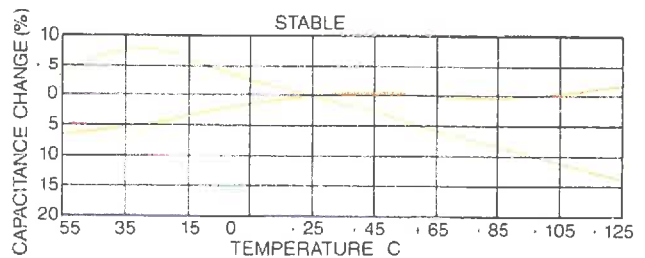
coefficient is computed by measuring the capacitance change between 25°C and 85°C and converting the change into ppm/°C. Additional details may be found in Mil-C-20 and RS-198.



STABLE & GENERAL PURPOSE TYPES

Aging Rates All hi-dielectric constant barium titanate based ceramics have a capacitance aging effect. The effect is a loss of capacitance with time which is caused by domain relaxation and stiffening phenomena. The loss is an inverse logarithmic function and is based on the capacitance value obtained at a given time after the last heat. Capacitance will be in limits at a given time after fabrication. While the aging effect is essentially dissipated by the time of delivery, "fresh" parts may be shipped under certain conditions. These may still be aging at a rate which will cause the capacitance to be high but will settle within limits in a short period of time. Hi-K capacitors will "de-age" with prolonged exposure to temperatures above or about 100°C. as may be experienced during a potting cure cycle or during high temperature environmental tests. The capacitance will then assume a higher value and the aging cycle will repeat itself.

When requiring good volumetric efficiency and stability, the stable WEECON provides the best compromise between small general purpose capacitors and larger, more stable types. They are best suited for coupling and by-pass applications in sensitive circuits with high component density and in circuits requiring the utmost in volumetric efficiency at rated temperatures. General purpose capacitors are not intended for resonant or frequency determining applications.



NOTE: For detailed electrical and qualification specifications see page 14 and EIA RS-198.