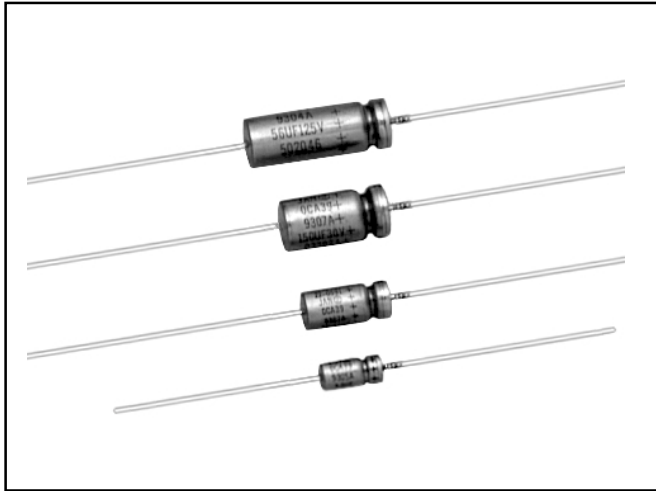


## Wet Tantalum Capacitors

Tantalum-Case with Glass-to-Tantalum Hermetic Seal For -55°C to + 200°C Operation



### FEATURES

Standard and Extended Ratings.

Model 135D tantalum-case tantalum electrolytic capacitors incorporate the advantages of all the varieties of electrolytic capacitors and eliminate most of the disadvantages. These units have a 3 volt reverse voltage capability at + 85°C and a higher ripple current capability than any other electrolytic type with similar combinations of capacitance and case size.

Designed for the aerospace applications, this capacitor was developed under partial sponsorship of the Marshall Space Flight Center, National Aeronautics and Space Administration. The capacitors have a high resistance to damage from shock and vibration. Extended range ratings are available.

Model 135D capacitors are commercial equivalents of Military Style CLR79 and CLR81, designed to meet the performance requirements of Military Specification MIL-C-39006/22/25. Capacitors to meet MIL-C-39006/22/25 should be ordered by part numbers shown in that specification.

**Life Test:** Capacitors are capable of withstanding a 2000 hour life test at a temperature of + 85°C or + 125°C at the applicable rated DC working voltage.

Following life test:

1. DCL, measured at + 85°C rated voltage, shall not be in excess of the original requirement.
2. The equivalent series resistance shall not exceed 150% of the initial requirement.
3. Change in capacitance shall not exceed 10% from the initial measurement.

### PERFORMANCE CHARACTERISTICS

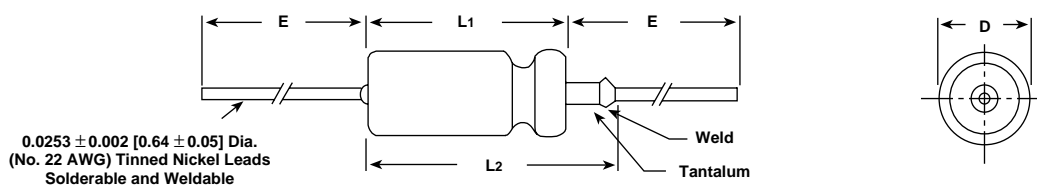
**Operating Temperature:** - 55°C to + 85°C. (To + 200°C with voltage derating.)

**Capacitance Tolerance:** At 120 Hz, + 25°C. ± 20% standard. ± 10%, ± 5% available as special.

DC Leakage Current (DCL Max.):

**At + 25°C and above:** Leakage current shall not exceed the values listed in the Standard Ratings Tables.

### DIMENSIONS in inches [millimeters]



CASE CODE		D	L1	L2 (Max.)	E	WEIGHT IN GRAMS (Max.)
TYPE 135D	CLR 79/81 EQUIV.					
C	T1	0.188 ± 0.016 [4.78 ± 0.41]	0.453 + 0.031 - 0.016 [11.51 + 0.79 - 0.41]	0.734 [18.64]	1.500 ± 0.250 [38.10 ± 6.35]	2.6
F	T2	0.281 ± 0.016 [7.14 ± 0.41]	0.641 + 0.031 - 0.016 [16.28 + 0.79 - 0.41]	0.922 [23.42]	2.250 ± 0.250 [57.15 ± 6.35]	6.2
T	T3	0.375 ± 0.016 [9.53 ± 0.41]	0.766 + 0.031 - 0.016 [19.46 + 0.79 - 0.41]	1.047 [26.59]	2.250 ± 0.250 [57.15 ± 6.35]	11.6
K	T4	0.375 ± 0.016 [9.53 ± 0.41]	1.062 + 0.031 - 0.016 [26.97 + 0.79 - 0.41]	1.343 [34.11]	2.250 ± 0.250 [57.15 ± 6.35]	17.7

\*For insulated parts, add 0.007" [0.178] to the diameter. The insulation shall lapover the ends of the capacitor body.



ORDERING INFORMATION					
<b>135D</b>	<b>306</b>	<b>X0</b>	<b>006</b>	<b>C</b>	<b>2</b>
MODEL	CAPACITANCE	CAPACITANCE TOLERANCE	DC VOLTAGE RATING AT +85°C	CASE CODE	STYLE NUMBER
	This is expressed in picofarads. The first two digits are the significant figures. The third is the number of zeros to follow.	X0 = ± 20% X9 = ± 10% X5 = ± 5%	This is expressed in volts. To complete the three-digit block, zeros precede the voltage rating. A decimal point is indicated by an "R" (6R3 = 6.3 volts).	See Ratings and Case Codes Table.	0 = No outer tube. 2 = Outer polyester film insulation. 6 = High temperature film insulation (above + 125°C).
<b>Packaging:</b> The use of formed plastic trays for packaging this type of axial lead component is standard. Tape and reel is not recommended due to the unit weight.					

STANDARD RATINGS										
CAPACITANCE (μF)	CASE CODE	PART NUMBER*	Max. ESR @ + 25°C 120 Hz (Ohms)	Max. IMP. @ - 55°C 120 Hz (Ohms)	Max. DCL (μA) @		Max. CAPACITANCE CHANGE (%) @			Max. RIPPLE 40kHz Irms (mA)
					+ 25°C	+ 85°C + 125°C	- 55°C	+ 85°C	+ 125°C	
<b>6 WVDC @ + 85°C . . . 4 WVDC @ + 125°C</b>										
30	C	135D306X0006C2	4.0	100	0.75	1.5	- 40	+ 10.5	+ 12	820
68	C	135D686X0006C2	2.9	60	0.75	1.5	- 40	+ 14	+ 16	960
140	F	135D147X0006F2	2.2	40	1.0	2.0	- 40	+ 14	+ 16	1200
270	F	135D277X0006F2	2.0	25	1.0	2.0	- 44	+ 12.5	+ 20	1375
330	T	135D337X0006T2	1.4	20	2.0	6.0	- 44	+ 14	+ 16	1800
560	T	135D567X0006T2	1.3	25	2.0	6.0	- 64	+ 17.5	+ 20	1900
1200	K	135D128X0006K2	1.0	20	3.0	12.0	- 80	+ 25	+ 25	2265
<b>8 WVDC @ + 85°C . . . 5 WVDC @ + 125°C</b>										
25	C	135D256X0008C2	4.0	100	0.75	1.5	- 40	+ 10.5	+ 12	820
56	C	135D566X0008C2	3.3	59	0.75	1.5	- 40	+ 14	+ 16	900
120	F	135D127X0008F2	2.6	50	1.0	2.0	- 44	+ 17.5	+ 20	1230
220	F	135D227X0008F2	2.4	30	1.0	2.0	- 44	+ 17.5	+ 20	1320
290	T	135D297X0008T2	1.8	25	2.0	6.0	- 64	+ 17.5	+ 20	1745
430	T	135D437X0008T2	1.4	25	2.0	6.0	- 64	+ 17.5	+ 20	1825
850	K	135D857X0008K2	1.0	22	3.0	12.0	- 80	+ 25	+ 25	2330
<b>10 WVDC @ + 85°C . . . 7 WVDC @ + 125°C</b>										
20	C	135D206X0010C2	4.0	120	0.75	1.5	- 32	+ 10.5	+ 12	820
47	C	135D476X0010C2	3.7	90	0.75	1.5	- 36	+ 14	+ 16	855
100	F	135D107X0010F2	2.4	60	1.0	2.0	- 36	+ 14	+ 16	1200
180	F	135D187X0010F2	2.2	40	1.0	2.0	- 36	+ 14	+ 16	1300
250	T	135D257X0010T2	1.8	30	2.0	6.0	- 40	+ 14	+ 16	1720
390	T	135D397X0010T2	1.5	25	2.0	6.0	- 64	+ 17.5	+ 20	1800
750	K	135D757X0010K2	1.0	23	3.0	12.0	- 80	+ 25	+ 25	2360
<b>15 WVDC @ + 85°C . . . 10 WVDC @ + 125°C</b>										
15	C	135D156X0015C2	4.4	155	0.75	1.5	- 24	+ 10.5	+ 12	780
33	C	135D336X0015C2	4.0	90	0.75	1.5	- 28	+ 14	+ 16	820
70	F	135D706X0015F2	2.8	75	1.0	2.0	- 28	+ 14	+ 16	1150
120	F	135D127X0015F2	2.6	50	1.0	2.0	- 28	+ 17.5	+ 20	1230
170	T	135D177X0015T2	2.4	35	2.0	6.0	- 32	+ 14	+ 16	1480
270	T	135D277X0015T2	2.2	30	2.0	6.0	- 56	+ 17.5	+ 20	1500
540	K	135D547X0015K2	1.0	23	3.0	12.0	- 80	+ 25	+ 25	2300



<b>STANDARD RATINGS</b>										
CAPACITANCE ( $\mu$ F)	CASE CODE	PART NUMBER*	Max. ESR	Max. IMP.	Max. DCL ( $\mu$ A) @		Max. CAPACITANCE CHANGE (%) @			Max. RIPPLE 40kHz I <sub>rms</sub> (mA)
			@ + 25°C 120 Hz (Ohms)	@ - 55°C 120 Hz (Ohms)	+ 25°C	+ 85°C + 125°C	- 55°C	+ 85°C	+ 125°C	
<b>25 WVDC @ + 85°C . . . 15 WVDC @ + 125°C</b>										
10	C	135D106X0025C2	5.3	220	0.75	1.5	- 16	+ 8	+ 9	715
22	C	135D226X0025C2	4.2	140	0.75	1.5	- 20	+ 10.5	+ 12	800
50	F	135D506X0025F2	3.0	70	1.0	2.0	- 28	+ 13	+ 15	1130
100	F	135D107X0025F2	2.8	50	1.0	2.0	- 28	+ 13	+ 15	1215
120	T	135D127X0025T2	2.6	38	2.0	6.0	- 32	+ 13	+ 15	1420
180	T	135D187X0025T2	2.2	32	2.0	6.0	- 48	+ 13	+ 15	1460
350	K	135D357X0025K2	1.3	24	3.0	12.0	- 70	+ 25	+ 25	1970
<b>30 WVDC @ + 85°C . . . 20 WVDC @ + 125°C</b>										
8	C	135D805X0030C2	6.6	275	0.75	1.5	- 16	+ 8	+ 12	640
15	C	135D156X0030C2	6.2	175	0.75	1.5	- 20	+ 10.5	+ 12	660
40	F	135D406X0030F2	4.0	65	1.0	2.0	- 24	+ 10.5	+ 12	1025
68	F	135D686X0030F2	2.9	60	1.0	2.0	- 24	+ 13	+ 15	1195
100	T	135D107X0030T2	2.7	40	2.0	6.0	- 28	+ 10.5	+ 12	1450
150	T	135D157X0030T2	2.3	35	2.0	6.0	- 48	+ 13	+ 15	1525
300	K	135D307X0030K2	1.4	25	3.0	12.0	- 60	+ 25	+ 25	1950
<b>35 WVDC @ + 85°C . . . 22 WVDC @ + 125°C</b>										
7	C	135D705X0035C2	7.0	315	0.75	1.5	- 16	+ 7	+ 10	620
15	C	135D156X0035C2	6.2	175	0.75	1.5	- 20	+ 10.5	+ 12	660
35	F	135D356X0035F2	4.2	75	1.0	2.0	- 23	+ 10.5	+ 12	1000
68	F	135D686X0035F2	2.9	60	1.0	2.0	- 24	+ 13	+ 15	1195
82	T	135D826X0035T2	2.5	45	2.0	6.0	- 32	+ 13	+ 15	1400
120	T	135D127X0035T2	2.4	40	2.0	6.0	- 41	+ 13	+ 15	1490
270	K	135D277X0035K2	1.4	26	3.0	12.0	- 58	+ 25	+ 25	1950
<b>50 WVDC @ + 85°C . . . 30 WVDC @ + 125°C</b>										
5	C	135D505X0050C2	8.0	400	0.75	2.0	- 16	+ 5	+ 6	580
10	C	135D106X0050C2	6.4	250	0.75	2.0	- 24	+ 8	+ 9	640
25	F	135D256X0050F2	4.6	95	1.0	3.0	- 20	+ 10.5	+ 12	950
47	F	135D476X0050F2	3.7	70	1.0	3.0	- 28	+ 13	+ 15	1065
60	T	135D606X0050T2	2.9	45	2.0	7.0	- 16	+ 10.5	+ 12	1285
82	T	135D826X0050T2	2.5	45	2.0	7.0	- 32	+ 13	+ 15	1400
160	K	135D167X0050K2	1.5	27	4.0	16.0	- 50	+ 25	+ 25	1900
<b>60 WVDC @ + 85°C . . . 40 WVDC @ + 125°C</b>										
4	C	135D405X0060C2	9.3	550	0.75	2.0	- 16	+ 5	+ 6	525
8.2	C	135D825X0060C2	6.6	275	0.75	2.0	- 24	+ 8	+ 9	625
20	F	135D206X0060F2	4.7	105	1.0	4.0	- 16	+ 8	+ 9	930
39	F	135D396X0060F2	4.1	90	1.0	4.0	- 28	+ 10.5	+ 15	1015
50	T	135D506X0060T2	2.9	50	2.0	7.0	- 16	+ 10.5	+ 12	1270
68	T	135D686X0060T2	2.5	50	2.0	7.0	- 32	+ 10.5	+ 15	1365
140	K	135D147X0060K2	1.5	28	4.0	16.0	- 40	+ 20	+ 20	1850
<b>75 WVDC @ + 85°C . . . 50 WVDC @ + 125°C</b>										
3.5	C	135D355X0075C2	9.5	650	1.0	2.0	- 16	+ 5	+ 6	525
6.8	C	135D685X0075C2	6.8	300	1.0	2.0	- 20	+ 8	+ 9	610
15	F	135D156X0075F2	5.3	150	1.0	4.0	- 16	+ 8	+ 9	890
33	F	135D336X0075F2	4.2	90	1.0	4.0	- 24	+ 10.5	+ 15	1000
40	T	135D406X0075T2	3.0	60	2.0	8.0	- 16	+ 10.5	+ 12	1250
56	T	135D566X0075T2	2.6	60	2.0	8.0	- 28	+ 10.5	+ 15	1335
110	K	135D117X0075K2	1.5	29	4.0	20.0	- 35	+ 20	+ 20	1850

\*Part Numbers listed are for units with  $\pm$  20% capacitance tolerance insulated capacitors. For  $\pm$  10% tolerance capacitors, change the digit following the letter "X" from "0" to "9"; for  $\pm$  5%, change the digit following the letter "X" from "0" to "5". For capacitors without outer polyester-film insulation, change the last digit in the part number from "2" to "0". For capacitors with a high temperature insulating sleeve, change the last digit in the part number from "2" to "6".



<b>STANDARD RATINGS</b>										
CAPACITANCE ( $\mu$ F)	CASE CODE	PART NUMBER*	Max. ESR @ + 25°C 120 Hz (Ohms)	Max. IMP. @ - 55°C 120 Hz (Ohms)	Max. DCL ( $\mu$ A) @		Max. CAPACITANCE CHANGE (%) @			Max. RIPPLE 40kHz I <sub>rms</sub> (mA)
					+ 25°C	+ 85°C + 125°C	- 55°C	+ 85°C	+ 125°C	
<b>100 WVDC @ + 85°C . . . 70 WVDC @ + 125°C</b>										
2.5	C	135D255X0100C2	10.6	950	1.0	2.0	- 16	+ 7	+ 8	505
4.7	C	135D475X0100C2	8.5	500	1.0	2.0	- 16	+ 7	+ 8	565
11	F	135D116X0100F2	6.0	200	1.0	4.0	- 16	+ 7	+ 8	835
22	F	135D226X0100F2	4.8	100	1.0	4.0	- 16	+ 7	+ 8	935
30	T	135D306X0100T2	3.3	80	2.0	8.0	- 16	+ 7	+ 8	1200
43	T	135D436X0100T2	2.6	70	2.0	8.0	- 20	+ 7	+ 8	1335
86	K	135D866X0100K2	1.6	30	4.0	20.0	- 25	+ 15	+ 15	1800
<b>125 WVDC @ + 85°C . . . 85 WVDC @ + 125°C</b>										
1.7	C	135D175X0125C2	15.6	1250	1.0	2.0	- 16	+ 7	+ 8	415
3.6	C	135D365X0125C2	11.1	600	1.0	2.0	- 16	+ 7	+ 8	495
9	F	135D905X0125F2	7.4	240	1.0	4.0	- 16	+ 7	+ 8	755
14	F	135D146X0125F2	5.7	167	1.0	4.0	- 16	+ 7	+ 8	860
18	T	135D186X0125T2	3.7	129	2.0	8.0	- 16	+ 7	+ 8	1130
25	T	135D256X0125T2	3.2	93	2.0	8.0	- 16	+ 7	+ 8	1200
56	K	135D566X0125K2	1.6	32	4.0	20.0	- 25	+ 15	+ 15	1800
<b>EXTENDED RATINGS</b>										
<b>6 WVDC @ + 85°C . . . 4 WVDC @ + 125°C</b>										
180	C	135D187X0006C2	2.7	33	2	6	- 50	14	16	1010
220	C	135D227X0006C2	3.0	36	2	9	- 64	13	16	1000
560	F	135D567X0006F2	1.8	21	3	9	- 77	16	20	1550
820	F	135D827X0006F2	2.5	18	3	14	- 88	16	20	1500
1200	T	135D128X0006T2	1.3	16	5	18	- 88	20	25	1930
1500	T	135D158X0006T2	1.5	18	5	20	- 90	20	25	1900
1800	K	135D188X0006K2	1.0	13	6	24	- 90	25	30	2330
2200	K	135D228X0006K2	1.0	13	6	24	- 90	25	30	2300
<b>8 WVDC @ + 85°C . . . 5 WVDC @ + 125°C</b>										
150	C	135D157X0008C2	3.0	36	2	6	- 45	14	16	960
180	C	135D187X0008C2	3.0	45	2	9	- 60	13	16	1000
470	F	135D477X0008F2	1.9	21	3	9	- 70	16	20	1500
680	F	135D687X0008F2	2.5	22	3	14	- 83	16	20	1500
1000	T	135D108X0008T2	1.3	16	6	18	- 82	20	25	1930
1500	T	135D158X0008T2	1.5	18	5	20	- 90	20	25	1900
1500	K	135D158X0008K2	1.0	13	7	24	- 88	25	30	2330
1800	K	135D188X0008K2	1.0	14	7	25	- 90	25	30	2300
<b>10 WVDC @ + 85°C . . . 7 WVDC @ + 125°C</b>										
120	C	135D127X0010C2	3.2	39	2	6	- 40	14	16	930
150	C	135D157X0010C2	3.0	54	2	9	- 55	13	16	900
390	F	135D397X0010F2	2.0	22	3	9	- 66	16	20	1470
560	F	135D567X0010F2	2.5	27	3	16	- 77	16	20	1450
820	T	135D827X0010T2	1.3	16	6	18	- 77	20	25	1930
1200	T	135D128X0010T2	1.5	18	5	20	- 88	20	25	1850
1200	K	135D128X0010K2	1.0	13	7	25	- 82	25	30	2330
1500	K	135D158X0010K2	1.0	15	7	25	- 88	25	30	2300
<b>15 WVDC @ + 85°C . . . 10 WVDC @ + 125°C</b>										
82	C	135D826X0015C2	3.3	43	2	6	- 35	12	16	915
100	C	135D107X0015C2	3.9	72	2	9	- 44	13	16	900
270	F	135D277X0015F2	2.1	25	3	9	- 62	16	15	1430
390	F	135D397X0015F2	2.5	31	3	16	- 66	16	20	1450
680	T	135D687X0015T2	1.4	16	6	18	- 74	20	25	1860
820	T	135D827X0015T2	1.7	22	6	24	- 77	20	25	1800
1000	K	135D108X0015K2	1.0	13	8	32	- 77	25	30	2330

\* Part Numbers listed are for units with  $\pm$  20% capacitance tolerance insulated capacitors. For  $\pm$  10% tolerance capacitors, change the digit following the letter "X" from "0" to "9"; for  $\pm$  5%, change the digit following the letter "X" from "0" to "5". For capacitors without outer polyester-film insulation, change the last digit in the part number from "2" to "0". For capacitors with a high temperature insulating sleeve, change the last digit in the part number from "2" to "6".



<b>EXTENDED RATINGS</b>										
CAPACITANCE ( $\mu$ F)	CASE CODE	PART NUMBER*	Max. ESR @ + 25°C 120 Hz (Ohms)	Max. IMP. @ - 55°C 120 Hz (Ohms)	Max. DCL ( $\mu$ A) @		Max. CAPACITANCE CHANGE (%) @			Max. RIPPLE 40kHz Irms (mA)
					+ 25°C	+ 85°C + 125°C	- 55°C	+ 85°C	+ 125°C	
<b>25 WVDC @ + 85°C . . . 15 WVDC @ + 125°C</b>										
56	C	135D566X0025C2	3.5	51	2	6	- 25	12	15	890
68	C	135D686X0025C2	4.2	90	2	9	- 40	12	15	850
180	F	135D187X0025F2	2.2	27	3	9	- 54	13	15	1400
270	F	135D277X0025F2	2.7	33	3	16	- 62	13	16	1400
470	T	135D477X0025T2	1.5	17	6	18	- 65	18	25	1800
560	T	135D567X0025T2	1.7	24	7	28	- 72	20	25	1750
680	K	135D687X0025K2	1.2	14	8	32	- 72	25	30	2120
<b>30 WVDC @ + 85°C . . . 20 WVDC @ + 125°C</b>										
47	C	135D476X0030C2	4.0	57	2	6	- 23	12	15	830
56	C	135D566X0030C2	5.2	100	2	9	- 38	12	15	800
150	F	135D157X0030F2	2.4	29	3	9	- 42	13	15	1340
220	F	135D227X0030F2	2.5	36	3	16	- 60	13	16	1200
390	T	135D397X0030T2	1.6	18	6	18	- 55	18	25	1740
470	T	135D477X0030T2	1.8	25	8	32	- 65	20	25	1500
560	K	135D567X0030K2	1.3	15	9	36	- 65	25	30	2040
<b>35 WVDC @ + 85°C . . . 22 WVDC @ + 125°C</b>										
39	C	135D396X0035C2	4.1	61	2	6	- 22	12	14	820
120	F	135D127X0035F2	2.5	31	3	10	- 40	13	15	1315
330	T	135D337X0035T2	1.8	20	6	18	- 50	16	25	1640
370	K	135D477X0035K2	1.3	15	9	36	- 60	25	30	2040
<b>50 WVDC @ + 85°C . . . 30 WVDC @ + 125°C</b>										
33	C	135D336X0050C2	4.4	135	2	9	- 29	10	12	700
100	F	135D107X0050F2	2.8	35	4	12	- 36	13	15	1240
120	F	135D127X0050F2	2.4	49	4	24	- 42	12	15	1200
270	T	135D277X0050T2	2.0	29	8	32	- 46	20	25	1450
330	K	135D337X0050K2	1.3	22	9	36	- 46	25	30	1900
<b>60 WVDC @ + 85°C . . . 40 WVDC @ + 125°C</b>										
27	C	135D276X0060C2	5.0	144	3	12	- 24	10	12	700
82	F	135D826X0060F2	2.9	37	4	16	- 30	15	15	1220
100	F	135D107X0060F2	2.5	54	4	20	- 36	12	15	1100
220	T	135D227X0060T2	1.4	29	8	32	- 40	16	20	1400
270	K	135D277X0060K2	1.4	23	9	36	- 45	20	25	1850
<b>75 WVDC @ + 85°C . . . 50 WVDC @ + 125°C</b>										
22	C	135D226X0075C2	5.0	157	3	12	- 19	10	12	600
68	F	135D686X0075F2	3.0	40	4	16	- 25	12	15	1200
82	F	135D826X0075F2	2.4	63	4	24	- 30	12	15	1000
180	T	135D187X0075T2	2.2	30	9	36	- 35	16	20	1300
220	K	135D227X0075K2	1.5	24	10	40	- 40	20	25	1800
<b>100 WVDC @ + 85°C . . . 65 WVDC @ + 125°C</b>										
10	C	135D106X0100C2	5.9	200	3	12	- 17	10	12	800
39	F	135D396X0100F2	3.5	80	5	24	- 20	12	15	1300
68	T	135D686X0100T2	2.2	40	10	40	- 30	14	16	1600
120	K	135D127X0100K2	2.7	30	12	48	- 35	15	17	2000
<b>125 WVDC @ + 85°C . . . 85 WVDC @ + 125°C</b>										
6.8	C	135D685X0125C2	11.7	300	3	12	- 14	10	12	700
27	F	135D276X0125F2	3.5	90	5	24	- 18	12	15	1200
47	T	135D476X0125T2	2.2	50	10	40	- 26	14	16	1500
82	K	135D826X0125K2	2.8	32	12	48	- 30	15	17	1900

\*Part Numbers listed are for units with  $\pm$  20% capacitance tolerance insulated capacitors. For  $\pm$  10% tolerance capacitors, change the digit following the letter "X" from "0" to "9"; for  $\pm$  5%, change the digit following the letter "X" from "0" to "5". For capacitors without outer polyester-film insulation, change the last digit in the part number from "2" to "0". For capacitors with a high temperature insulating sleeve, change the last digit in the part number from "2" to "6".