

# Type 325/326, $-55\text{ }^{\circ}\text{C}$ to $125\text{ }^{\circ}\text{C}$ Long-Life, Switching Power Grade Radial High Temperature and Ultra-Low ESR



Type 325



Type 326

The Types 325 and 326 are the ultra-wide-temperature, low-ESR capacitors for switching power-supply outputs and automotive applications. The  $125\text{ }^{\circ}\text{C}$  capability and exceptionally low ESRs enable high ripple-current capability. With series inductance of 12 to 16 nH and ripple currents to 27 amps one of these capacitors can save by replacing eight to ten of the 12.5 mm diameter capacitors routinely at the output of switching power supplies. Type 325 has three leads for rugged, reverse-proof mounting, and Type 326 has two leads.

## Highlights

- 2000 hour life test at  $125\text{ }^{\circ}\text{C}$
- Ripple Current to 27 amps
- ESRs to  $5\text{ m}\Omega$
- $> 90\%$  capacitance at  $-40\text{ }^{\circ}\text{C}$
- Replaces multiple capacitors

## Specifications

**Operating Temperature:**

$-55\text{ }^{\circ}\text{C}$  to  $125\text{ }^{\circ}\text{C}$

**Rated Voltage:**

6.3 to 63 Vdc –

**Capacitance:**

880  $\mu\text{F}$  to 46,000  $\mu\text{F}$

**Capacitance Tolerance:**

$-10 +75\%$

**Leakage Current:**

$\leq 0.5 \sqrt{CV}\text{ }\mu\text{A}$ , 4 mA max, 5 minutes

**Cold Impedance:**

$-55\text{ }^{\circ}\text{C}$  multiple of  $25\text{ }^{\circ}\text{C}$   $Z \leq 2.5 @ 120\text{ Hz}$

$\leq 20$  from 20–100 kHz

**Ripple Current Multipliers:**

**Ambient Temperature**

45°C	55°C	65°C	75°C	85°C	95°C	105°C	115°C	125°C
1.39	1.3	1.21	1.11	1.00	0.88	0.73	0.55	0.26

**Frequency**

120 Hz	360 Hz	400 Hz	1 kHz	20-100 kHz
see ratings	0.76	0.77	0.85	1.00

**Life Test:**

2000 h with rated voltage at  $125\text{ }^{\circ}\text{C}$

$\Delta$  capacitance  $\pm 10\%$

ESR 125 % of limit

DCL 100 % of limit

**Load Life:**

4000 h at full load at  $85\text{ }^{\circ}\text{C}$

$\Delta$  capacitance  $\pm 10\%$

ESR 200 % of limit

DCL 100 % of limit

**Shelf Life:**

500 h at  $105\text{ }^{\circ}\text{C}$ ,

$\Delta$  capacitance  $\pm 10\%$ ,

ESR 110% of limit,

DCL 200% of limit

**Vibration:**

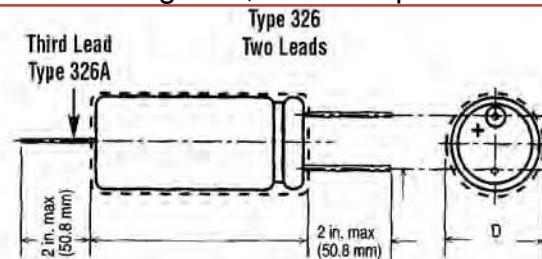
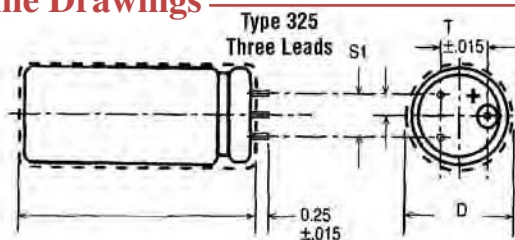
10 to 55 Hz, 0.06" and 10 g max, 2 h each plane



RoHS  
Compliant

Complies with the EU Directive 2002/95/EC requirement restricting the use of Lead (Pb), Mercury (Hg), Cadmium (Cd), Hexavalent chromium (Cr(VI)), PolyBrominated Biphenyls (PBB) and PolyBrominated Diphenyl Ethers (PBDE).

## Outline Drawings



# Type 325/326, -55 °C to 125 °C Long-Life, Switching Power Grade Radial

Case Code	Insulated		Bare Can		Lead Spacing		Lead Diameter	
	D ± 0.015 (0.4 mm)	Epoxy endseal L Max	D ± 0.015 (0.4 mm)	L ± 0.030 (0.8 mm)	Type 325	Type 326	dia.	AWG
	L ± 0.062 (1.6 mm)				S1	T	S2	
	D x L		D x L		±0.020(0.5 mm) ±0.020(0.5 mm)			
<b>Case Dimensions in Inches</b>								
<b>GE</b>	.765 x 1.150	1.212	0.750 x 1.125	0.200	0.300	0.300	0.040	18
<b>GJ</b>	.765 x 1.650	1.712	0.750 x 1.625	0.200	0.300	0.300	0.040	18
<b>GL</b>	.765 x 2.150	2.212	0.750 x 2.125	0.200	0.300	0.300	0.040	18
<b>GP</b>	.765 x 2.650	2.712	0.750 x 2.625	0.200	0.300	0.300	0.040	18
<b>GS</b>	.765 x 3.150	3.212	0.750 x 3.125	0.200	0.300	0.300	0.040	18
<b>GT</b>	.765 x 3.650	3.712	0.750 x 3.625	0.200	0.300	0.300	0.040	18
<b>HE</b>	.890 x 1.150	1.212	0.875 x 1.125	0.300	0.400	0.300	0.040	18
<b>HJ</b>	.890 x 1.650	1.712	0.875 x 1.625	0.300	0.400	0.300	0.040	18
<b>HL</b>	.890 x 2.150	2.212	0.875 x 2.125	0.300	0.400	0.300	0.040	18
<b>HP</b>	.890 x 2.650	2.712	0.875 x 2.625	0.300	0.400	0.300	0.040	18
<b>HS</b>	.890 x 3.150	3.212	0.875 x 3.125	0.300	0.400	0.300	0.040	18
<b>HT</b>	.890 x 3.650	3.712	0.875 x 3.625	0.300	0.400	0.300	0.040	18
<b>JE</b>	1.015 x 1.150	1.212	1.000 x 1.125	0.300	0.400	0.400	0.040	18
<b>JJ</b>	1.015 x 1.650	1.712	1.000 x 1.625	0.300	0.400	0.400	0.040	18
<b>JL</b>	1.015 x 2.150	2.212	1.000 x 2.125	0.300	0.400	0.400	0.040	18
<b>JP</b>	1.015 x 2.650	2.712	1.000 x 2.625	0.300	0.400	0.400	0.040	18
<b>JS</b>	1.015 x 3.150	3.212	1.000 x 3.125	0.300	0.400	0.400	0.040	18
<b>JT</b>	1.015 x 3.650	3.712	1.000 x 3.625	0.300	0.400	0.400	0.040	18
<b>Case Dimensions in Millimeters</b>								
<b>GE</b>	19.4 x 29.2	30.8	19.1 x 28.6	5.08	7.62	7.62	1.02	18
<b>GJ</b>	19.4 x 41.9	43.5	19.1 x 41.3	5.08	7.62	7.62	1.02	18
<b>GL</b>	19.4 x 54.6	56.2	19.1 x 54.0	5.08	7.62	7.62	1.02	18
<b>GP</b>	19.4 x 67.3	68.9	19.1 x 66.7	5.08	7.62	7.62	1.02	18
<b>GS</b>	19.4 x 80.0	81.6	19.1 x 79.4	5.08	7.62	7.62	1.02	18
<b>GT</b>	19.4 x 92.7	94.3	19.1 x 92.1	5.08	7.62	7.62	1.02	18
<b>HE</b>	22.6 x 29.2	30.8	22.2 x 28.6	7.62	10.16	7.62	1.02	18
<b>HJ</b>	22.6 x 41.9	43.5	22.2 x 41.3	7.62	10.16	7.62	1.02	18
<b>HL</b>	22.6 x 54.6	56.2	22.2 x 54.0	7.62	10.16	7.62	1.02	18
<b>HP</b>	22.6 x 67.3	68.9	22.2 x 66.7	7.62	10.16	7.62	1.02	18
<b>HS</b>	22.6 x 80.0	81.6	22.2 x 79.4	7.62	10.16	7.62	1.02	18
<b>HT</b>	22.6 x 92.7	94.3	22.2 x 92.1	7.62	10.16	7.62	1.02	18
<b>JE</b>	25.8 x 29.2	30.8	25.4 x 28.6	7.62	10.16	10.16	1.02	18
<b>JJ</b>	25.8 x 41.9	43.5	25.4 x 41.3	7.62	10.16	10.16	1.02	18
<b>HL</b>	25.8 x 54.6	56.2	25.4 x 54.0	7.62	10.16	10.16	1.02	18
<b>JP</b>	25.8 x 67.3	68.9	25.4 x 66.7	7.62	10.16	10.16	1.02	18
<b>JS</b>	25.8 x 80.0	81.6	25.4 x 79.4	7.62	10.16	10.16	1.02	18
<b>JT</b>	25.8 x 92.7	94.3	25.4 x 92.1	7.62	10.16	10.16	1.02	18

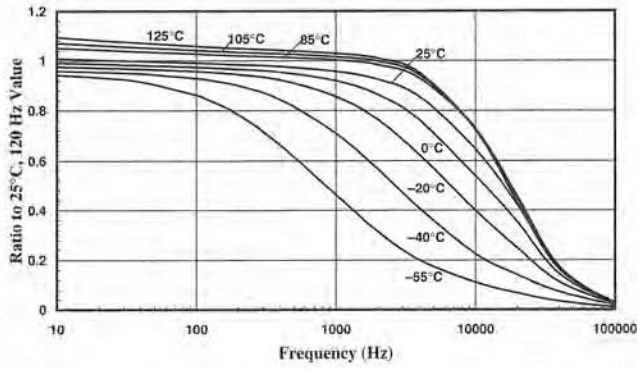
## Part Numbering System

<b>325</b>	<b>393</b>	<b>U</b>	<b>6R3</b>	<b>JS</b>	<b>1</b>	<b>E</b>
<b>Type</b>	<b>Capacitance</b>	<b>Tolerance</b>	<b>Voltage</b>	<b>Case Code</b>	<b>Insulation</b>	<b>Epoxy</b>
<b>325</b> - 3 leads <b>326</b> - 2 leads <b>326A</b> - 3 leads, laydown	<b>152</b> =1500 µF <b>393</b> =39000 µF	<b>M</b> = 20% <b>T</b> = 10% + 50% <b>U</b> = 10% + 75%	<b>6R3</b> =6.3 V <b>035</b> =35 V	See Ratings	<b>0</b> = bare can <b>1</b> = polyester	<b>(blank)</b> = no epoxy <b>E</b> = Epoxy endseal

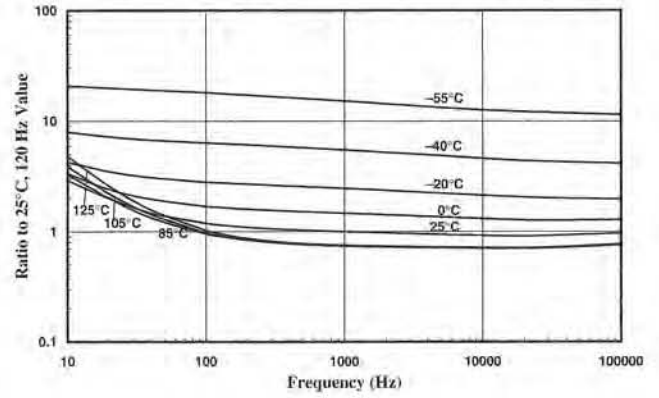
# Type 325/326, -55 °C to 125 °C Long-Life, Switching Power Grade Radial

## Typical Performance Curves

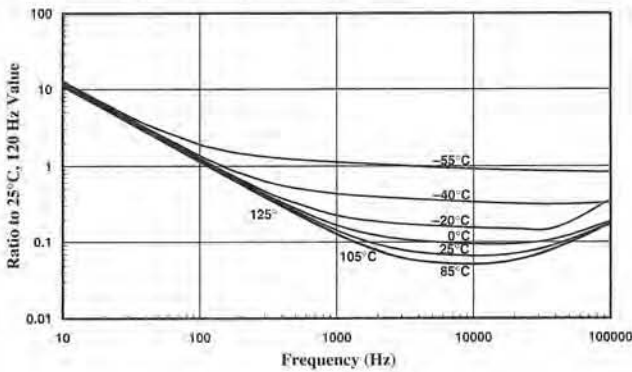
Type 325 Capacitance vs Temperature & Frequency, 10000  $\mu$ F, 16 V



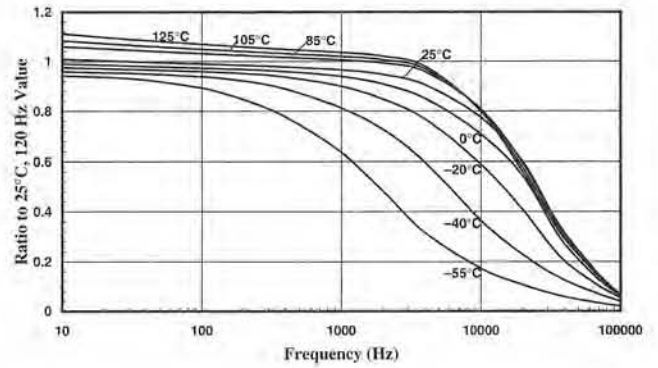
Type 325 ESR vs Temperature and Frequency, 10000  $\mu$ F, 16 V



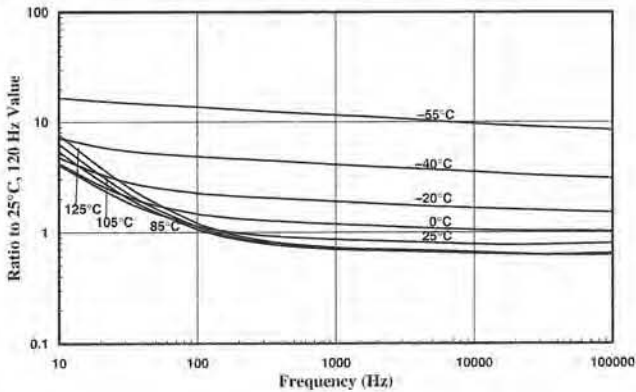
Type 325 Impedance vs Temperature and Frequency, 10000  $\mu$ F, 16 V



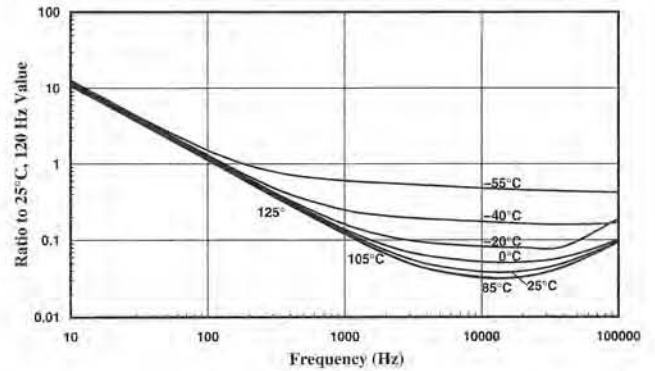
Type 325 Capacitance vs Temperature & Frequency, 5600  $\mu$ F, 25 V



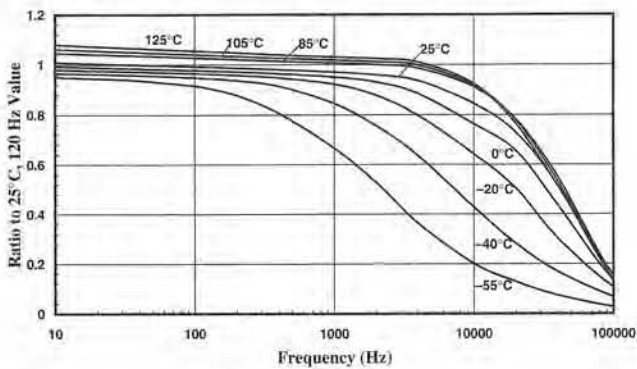
Type 325 ESR vs Temperature and Frequency, 5600  $\mu$ F, 25 V



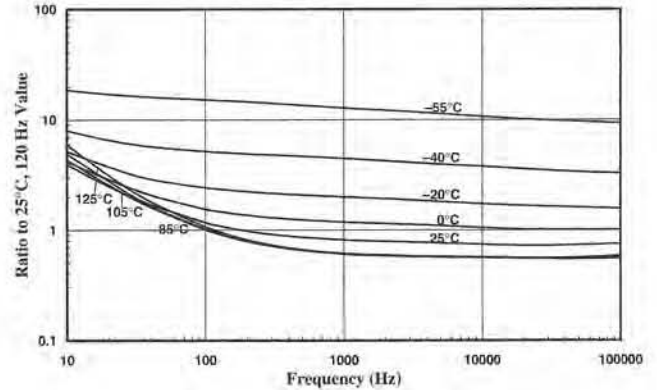
Type 325 Impedance vs Temperature and Frequency, 5600  $\mu$ F, 25 V



Type 325 Capacitance vs Temperature & Frequency, 3900  $\mu$ F, 35 V



Type 325 ESR vs Temperature and Frequency, 3900  $\mu$ F, 35 V



# Type 325/326, -55 °C to 125 °C Long-Life, Switching Power Grade Radial Ratings

Cap. (µF)	Catalog Part Number	ESR MAX @ 25°C		Ripple MAX @ 85°C		Nom Size Insulated D X L (in)
		120 Hz 20 kHz (mΩ)	120 Hz 20 kHz (A)	120 Hz 20 kHz (mΩ)	120 Hz 20 kHz (A)	
<b>6.3 Vdc (8 Vdc Surge)</b>						
4400	325442U6R3GE1	65.7	36.2	3.95	5.31	0.77 X 1.15
5800	325582U6R3HE1	42.8	26.0	5.37	6.89	0.89 X 1.15
7100	325712U6R3GJ1	41.9	23.5	5.68	7.59	0.77 X 1.65
7700	325772U6R3JE1	28.5	17.2	7.16	9.22	1.02 X 1.15
11000	325113U6R3GL1	29.5	16.2	7.56	10.21	0.77 X 2.15
12000	325123U6R3HJ1	26.5	14.7	7.81	10.51	0.89 X 1.65
14000	325143U6R3GP1	20.9	13.6	9.85	12.21	0.77 X 2.65
15000	325153U6R3JJ1	16.2	11.1	10.88	13.13	1.02 X 1.65
17000	325173U6R3HL1	18.7	11.0	10.46	13.60	0.89 X 2.15
18000	325183U6R3GS1	18.1	11.6	11.42	14.23	0.77 X 3.15
21000	325213U6R3GT1	16.5	10.6	12.75	15.94	0.77 X 3.65
23000	325233U6R3HP1	14.3	8.6	13.02	16.81	0.89 X 2.65
23000	325233U6R3JL1	14.3	8.7	12.86	16.51	1.02 X 2.15
29000	325293U6R3HS1	10.5	7.4	16.40	19.48	0.89 X 3.15
31000	325313U6R3JP1	10.5	7.3	16.40	19.61	1.02 X 2.65
35000	325353U6R3HT1	10.1	6.2	17.75	22.70	0.89 X 3.65
39000	325393U6R3JS1	9.5	6.3	18.55	22.89	1.02 X 3.15
46000	325463U6R3JT1	8.3	5.2	21.23	26.70	1.02 X 3.65
<b>10 Vdc (13 Vdc Surge)</b>						
3300	325332U010GE1	75.5	36.2	3.68	5.31	0.77 X 1.15
4700	325472U010HE1	42.8	26.0	5.37	6.89	0.89 X 1.15
5400	325542U010GJ1	42.7	23.5	5.63	7.59	0.77 X 1.65
6400	325642U010JE1	36.7	17.2	6.30	9.22	1.02 X 1.15
8000	325802U010GL1	31.4	16.2	7.33	10.21	0.77 X 2.15
9300	325932U010HJ1	25.7	14.7	7.95	10.51	0.89 X 1.65
11000	325113U010GP1	20.9	13.6	9.85	12.21	0.77 X 2.65
13000	325133U010GS1	19	11.6	11.13	14.23	0.77 X 3.15
13000	325133U010JJ1	22.9	11.1	9.16	13.13	1.02 X 1.65
14000	325143U010HL1	17.3	11.0	10.86	13.60	0.89 X 2.15
16000	325163U010GT1	17	10.4	12.57	16.08	0.77 X 3.65
19000	325193U010HP1	14.2	8.6	13.04	16.81	0.89 X 2.65
19000	325193U010JL1	16.2	8.7	12.10	16.51	1.02 X 2.15
23000	325233U010HS1	11.4	7.4	15.73	19.48	0.89 X 3.15
26000	325263U010JP1	11.4	7.3	15.73	19.61	1.02 X 2.65
28000	325283U010HT1	10.1	6.2	17.75	22.70	0.89 X 3.6
32000	325323U010JS1	10.5	6.3	17.69	22.89	1.02 X 3.15
38000	325383U010JT1	8.7	5.2	20.67	26.70	1.02 X 3.65
<b>16 Vdc (20 Vdc Surge)</b>						
2000	325202U016GE1	92.6	35.0	3.33	5.41	0.77 X 1.15
2800	325282U016HE1	63.8	26.0	4.40	6.89	0.89 X 1.15
3200	325322U016GJ1	50.4	23.5	5.18	7.59	0.77 X 1.65
3800	325382U016JE1	48.6	17.2	5.48	9.22	1.02 X 1.15
4800	325482U016GL1	35.3	16.2	6.92	10.21	0.77 X 2.15
5600	325562U016HJ1	32.2	14.7	7.09	10.51	0.89 X 1.65
6400	325642U016GP1	26.6	13.6	8.73	12.21	0.77 X 2.65
7700	325772U016JJ1	24.8	11.1	8.79	13.13	1.02 X 1.65
8000	325802U016GS1	22.8	11.6	10.17	14.23	0.77 X 3.15

Cap. (µF)	Catalog Part Number	ESR MAX @ 25°C		Ripple MAX @ 85°C		Nom Size Insulated D X L (in)
		120 Hz 20 kHz (mΩ)	120 Hz 20 kHz (A)	120 Hz 20 kHz (mΩ)	120 Hz 20 kHz (A)	
8400	325842U016HL1	22.1	11.0	9.61	13.60	0.89 X 2.15
9600	325962U016GT1	24.8	10.1	10.41	16.28	0.77 X 3.65
11000	325113U016HP1	17.2	8.6	11.87	16.81	0.89 X 2.65
12000	325123U016JL1	17.2	8.7	11.74	16.51	1.02 X 2.15
14000	325143U016HS1	14.3	7.4	14.05	19.48	0.89 X 3.15
15000	325153U016JP1	13.3	7.3	14.55	19.61	1.02 X 2.65
17000	325173U016HT1	14.9	6.2	14.59	22.60	0.89 X 3.65
19000	325193U016JS1	11.4	6.3	16.92	22.89	1.02 X 3.15
23000	325233U016JT1	9.5	5.2	19.82	26.70	1.02 X 3.65
<b>25 Vdc (32 Vdc Surge)</b>						
1300	325132U025GE1	109.0	35.0	3.07	5.41	0.77 X 1.15
1800	325182U025HE1	70.8	26.0	4.17	6.89	0.89 X 1.15
2100	325212U025GJ1	55.1	23.5	4.96	7.59	0.77 X 1.65
2500	325252U025JE1	52.5	17.2	5.27	9.22	1.02 X 1.15
3100	325312U025GL1	38.0	16.2	6.66	10.21	0.77 X 2.15
3600	325362U025HJ1	35.0	14.7	6.80	10.51	0.89 X 1.65
4100	325412U025GP1	28.6	13.6	8.42	12.21	0.77 X 2.65
4900	325492U025JJ1	26.6	11.1	8.49	13.13	1.02 X 1.65
5100	325512U025GS1	24.8	11.6	9.76	14.23	0.77 X 3.15
5400	325542U025HL1	24.0	11.0	9.22	13.60	0.89 X 2.15
6200	325622U025GT1	24.8	10.1	10.41	16.28	0.77 X 3.65
7200	325722U025HP1	19.1	8.6	11.26	16.81	0.89 X 2.65
7400	325742U025JL1	19.1	8.7	11.13	16.51	1.02 X 2.15
8900	325892U025HS1	15.2	7.4	13.60	19.48	0.89 X 3.15
9800	325982U025JP1	15.3	7.3	13.60	19.61	1.02 X 2.65
11000	325113U025HT1	14.9	6.2	14.59	22.60	0.89 X 3.65
12000	325123U025JS1	12.4	6.3	16.27	22.89	1.02 X 3.15
15000	325153U025JT1	9.5	5.2	19.82	26.7	1.02 X 3.65
<b>35 Vdc (44 Vdc Surge)</b>						
880	325881U035GE1	124.0	35.0	2.88	5.41	0.77 X 1.15
1100	325112U035HE1	85.6	26.0	3.79	6.89	0.89 X 1.15
1500	325152U035GJ1	66.6	23.5	4.51	7.59	0.77 X 1.65
1700	325172U035JE1	63.8	17.2	4.78	9.22	1.02 X 1.15
2200	325222U035HJ1	42.8	14.7	6.15	10.51	0.89 X 1.65
2200	325222U035GL1	45.7	16.2	6.08	10.21	0.77 X 2.15
3000	325302U035GP1	35.2	13.6	7.59	12.21	0.77 X 2.65
3300	325332U035HL1	29.7	11.0	8.28	13.60	0.89 X 2.15
3400	325342U035JJ1	32.4	11.1	7.70	13.13	1.02 X 1.65
3700	325372U035GS1	28.6	11.6	9.09	14.23	0.77 X 3.15
4300	325432U035GT1	24.8	10.1	10.41	16.28	0.77 X 3.65
4400	325442U035HP1	22.9	8.6	10.28	16.81	0.89 X 2.65
5100	325512U035JL1	21.9	8.7	10.39	16.51	1.02 X 2.15
5500	325552U035HS1	18.1	7.4	12.47	19.48	0.89 X 3.15
6300	325632U035HT1	14.9	6.2	14.59	22.60	0.89 X 3.65
6800	325682U035JP1	17.1	7.3	12.83	19.61	1.02 X 2.65
8500	325852U035JS1	14.3	6.3	15.15	22.89	1.02 X 3.15
10000	325103U035JT1	12.4	5.2	17.37	26.70	1.02 X 3.65