

FE SERIES FOR LARGE CURRENT

The FE series offers small, high-capacitance electric double-layer capacitors suitable for supplying a large current in a short time.

These capacitors are ideal for momentarily backing up a large-current, short-time load in an electronic system (in the event of momentary power failure).

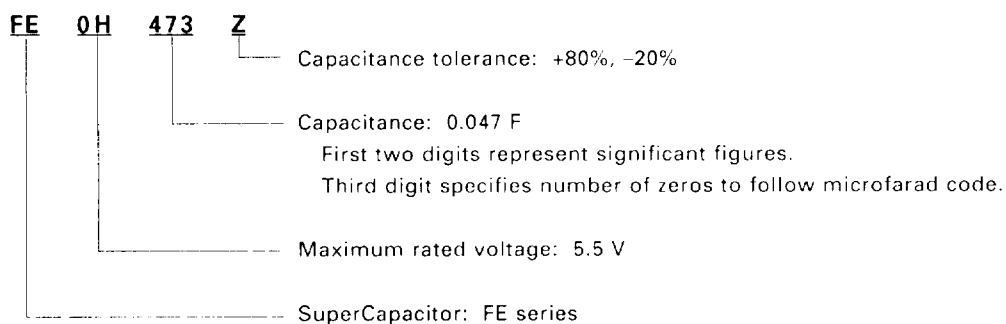
■ FEATURES

- Extremely low equivalent series resistance (ESR), ideal for supplying several 10 mA to 1 A for short periods of time (about 1/2 the CV value when compared to the ESR of FA series)
- Small (about 1/4 in volume of aluminum electrolytic capacitor and 3/5 of FA series at same CV value)
- Product variety, including low-capacitance and high-capacitance models (0.047 F to 1.5 F)

■ APPLICATIONS

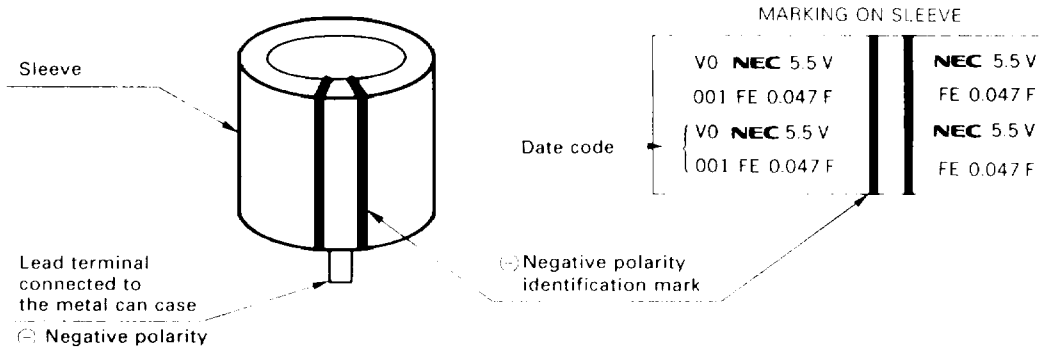
Momentary backup sources for microcomputers, SRAMs, and DRAMs, and auxiliary power source for mechanical systems (motors, relays, electromagnetic valves).

■ PART NUMBER SYSTEM

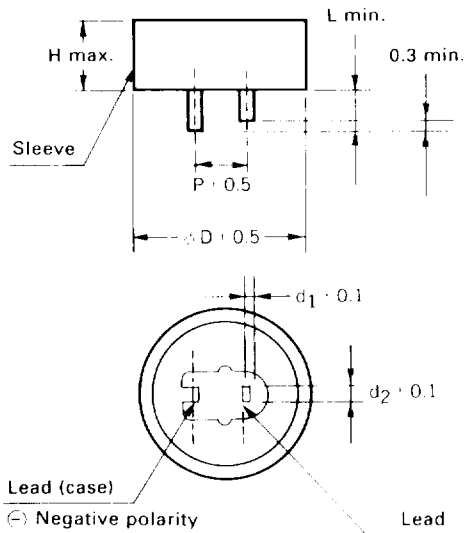


MARKINGS

Markings are made with black ink on the green sleeve.



DIMENSIONS AND STANDARD RATINGS



Part No.	Dimensions mm (inch)						Weight g (oz)
	D	H	P	d ₁	d ₂	L	
FE0H473Z	14.5 (0.57)	14.0 (0.55)	5.1 (0.2)	0.4 (0.016)	1.2 (0.047)	2.2 (0.087)	1.2 (0.042)
FE0H104Z	16.0 (0.65)	14.0 (0.55)	5.1 (0.2)	0.4 (0.016)	1.2 (0.047)	2.7 (0.106)	5 (0.177)
FE0H224Z	21.5 (0.85)	15.5 (0.61)	7.6 (0.3)	0.6 (0.024)	1.2 (0.047)	3.0 (0.118)	9.5 (0.336)
FE0H474Z	28.5 (1.12)	16.5 (0.65)	10.2 (0.4)	0.6 (0.024)	1.4 (0.055)	6.1 (0.240)	16 (0.565)
FE0H105Z	36.5 (1.44)	18.5 (0.73)	15.0 (0.59)	0.6 (0.024)	1.7 (0.067)	6.1 (0.240)	38 (1.343)
FE0H155Z	44.5 (1.75)	18.5 (0.73)	20.0 (0.79)	1.0 (0.039)	1.4 (0.055)	6.1 (0.240)	72 (2.544)

Part Number	Max. Rated Voltage (V)	Nominal Capacitance (F)	Max. Current at 30 minutes (mA)	Max. ESR (at 1 kHz) (Ω)
FE0H473Z	5.5	0.047	0.071	14.0
FE0H104Z	5.5	0.10	0.15	6.5
FE0H224Z	5.5	0.22	0.33	3.5
FE0H474Z	5.5	0.47	0.71	1.8
FE0H105Z	5.5	1.0	1.5	1.0
FE0H155Z	5.5	1.5	2.3	0.6

SPECIFICATIONS

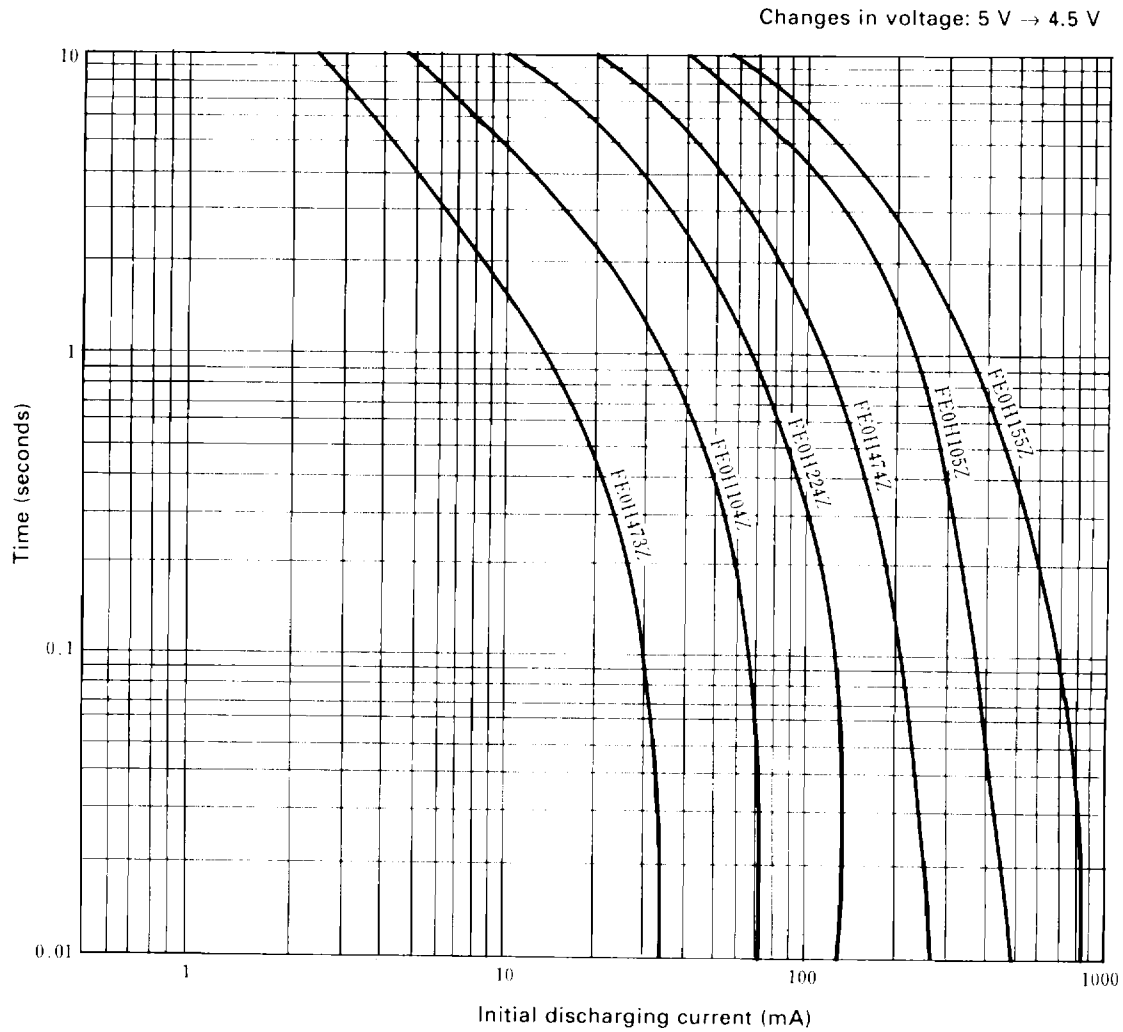
Item	Specification		Test Conditions	
Operating Temp. Range	-40 to 70 °C			
MAX. Rated Voltage	5.5 Vdc			
Capacitance Range	0.047 to 1.5 F (Refer to standard ratings)			
Capacitance Tolerance	+80%, -20%		Refer to measuring conditions	
ESR*	Refer to standard ratings		Refer to measuring conditions	
Current (at 30 minutes)	Refer to standard ratings		Refer to measuring conditions	
Surge Voltage	Capacitance	More than 90% of initial requirement	At 70 °C Surge voltage 6.3 V Charge : 30 sec. Discharge: 9 min. 30 sec. 1 000 cycles Charge resistance: 0.047 F 300 Ω 0.10 F 150 Ω 0.22 F 56 Ω 0.47 F 30 Ω 1.0, 1.5 F 15 Ω Discharge resistance: not applicable (0 Ω)	
	ESR	Not to exceed 120% of initial requirement		
Stability at Low and High Temperature	Current at 30 minutes	Not to exceed 120% of initial requirement	Step 1 : +25 °C Step 2 : -40 °C Step 3 : +25 °C Step 4 : +70 °C Step 5 : +25 °C	
	Step 2	Capacitance		More than 40% of initial value
		ESR		Not to exceed 4 times initial value
	Step 4	Capacitance		Not to exceed 200% of initial value
		ESR		Not to exceed initial requirement
	Current at 30 minutes	Not to exceed 1.5 CV (mA)		
	Δ C/C	Not to change more than +20% from initial value		
	Step 5	ESR	Not to exceed initial requirement	
	Current at 30 minutes	Not to exceed initial requirement		
Lead Strength (Tensile)	There shall be no loosening nor permanent damage of the leads		0.047 to 0.47 F : 1 kg, 10 sec. 1 F, 1.5 F : 2.5 kg, 10 sec.	
Vibration	Capacitance	Shall meet initial requirement	10 to 55 Hz Double amplitude 1.5 mm 2 hours per 3 direction	
	ESR	Shall meet initial requirement		
	Current at 30 minutes	Shall meet initial requirement		
Solderability	Immerced lead surface shall be at least 75% covered with new solder		230 ± 5 °C Immersion depth: 5 ± 0.5 sec. 1.6 mm from body	
Heat Resistance Soldering	Capacitance	Shall meet initial requirement	260 ± 10 °C, 10 ± 1 sec. Immersion depth: 1.6 mm from body	
	ESR	Shall meet initial requirement		
	Current at 30 minutes	Shall meet initial requirement		
Temperature Cycling	Capacitance	Shall meet initial requirement	-40 to 70 °C, 5 cycles	
	ESR	Shall meet initial requirement		
	Current at 30 minutes	Shall meet initial requirement		
Moisture Resistance	Capacitance change	Not to exceed +20% of initial value	40 ± 2 °C V, 90 to 95% RH 240 hours	
	ESR	Not to exceed 120% of initial requirement		
	Current at 30 minutes	Not to exceed 120% of initial requirement		
Load Life	Capacitance change	Not to exceed +30% of initial value	70 ± 2 °C 5.5 V applied 1 000 hours	
	ESR	Not to exceed 300% of initial requirement		
	Current at 30 minutes	Not to exceed 200% of initial requirement		

*ESR: Equivalent series resistance

■ DISCHARGING TIME

The chart below shows the discharging time of the FE series with a resistive load.

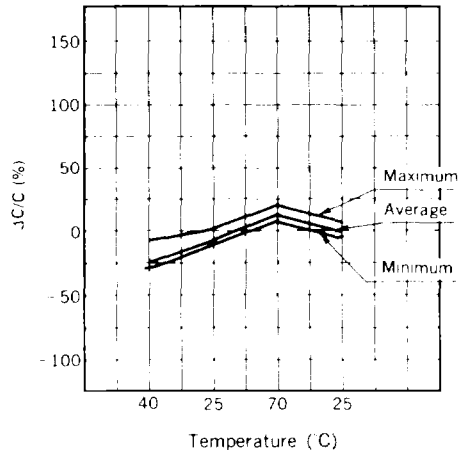
The horizontal axis in this chart indicates that the initial discharging current (discharging current at a capacitor terminal voltage of 5 V). The vertical axis indicates the time required for the capacitor terminal voltage to decrease from 5 to 4 V.



TYPICAL PERFORMANCE DATA (Samples: FE0H105Z)

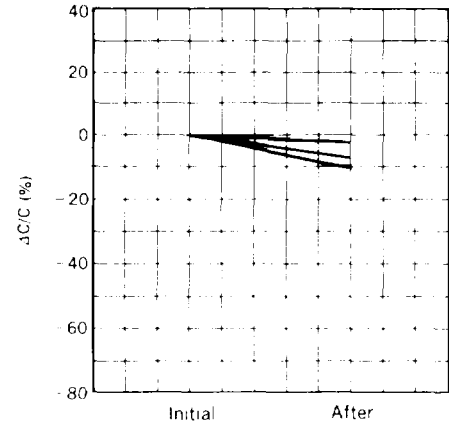
Environmental test data

Temperature characteristics (condition:
-40 °C → 25 °C → 70 °C → 25 °C, n=10)

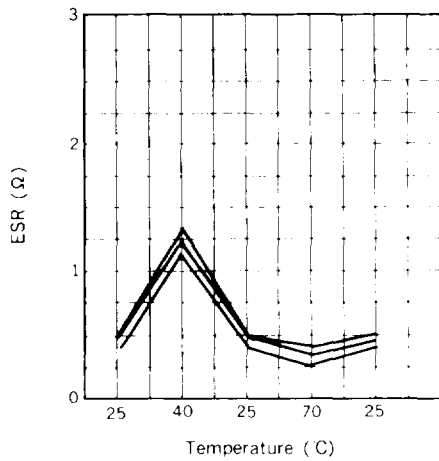


Capacitance change

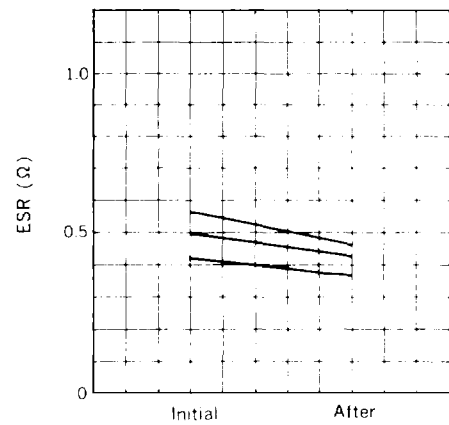
Surge voltage (condition: 70 °C, 6.3 V
(charging for 30 sec. → discharging
for 570 sec.), 1,000 cycles, n=10)



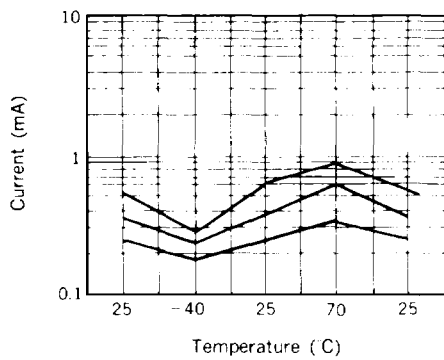
Capacitance change



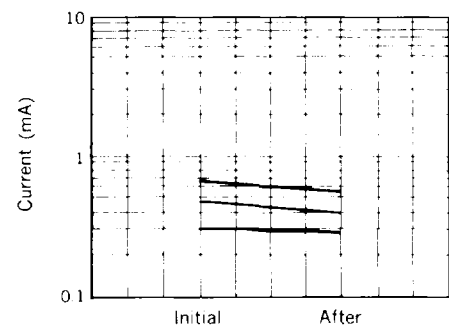
ESR change



ESR change



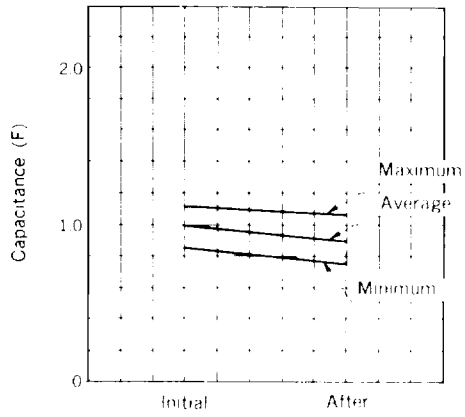
Current at 30 minutes change



Current at 30 minutes change

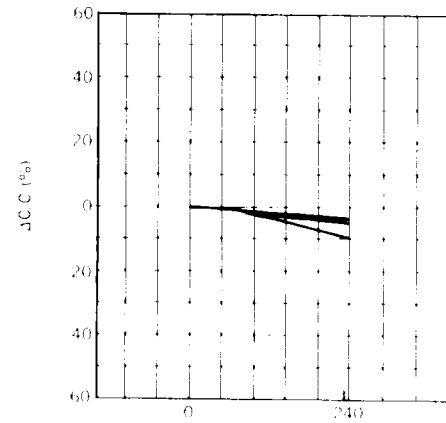
TYPICAL PERFORMANCE DATA (Continued)

Temperature cycling (condition:
 -40 °C → 25 °C → 70 °C → 25 °C, 5 cycles, n=20)

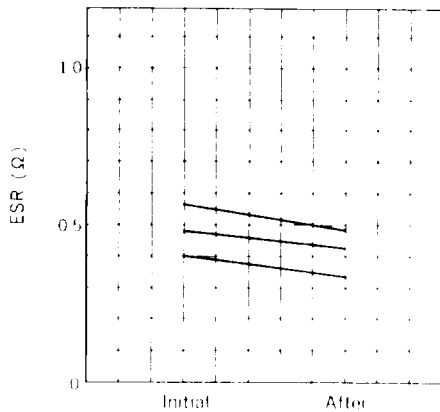


Capacitance change

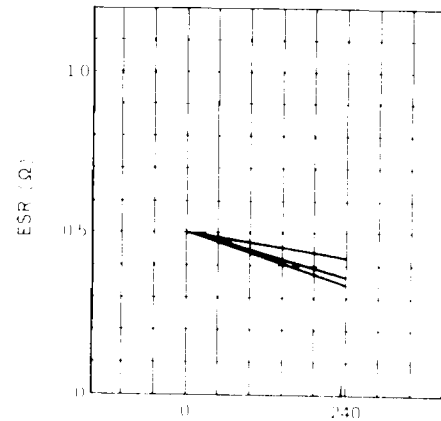
Moisture resistance test (condition: 40±2 °C,
 90 to 95 % RH, no-load, 240 hours, n=20)



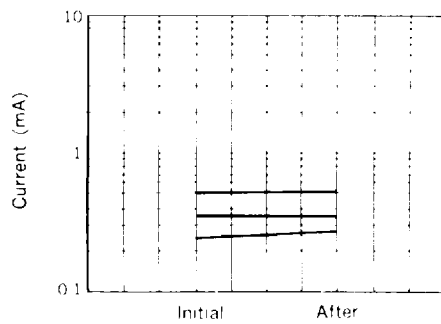
Capacitance change



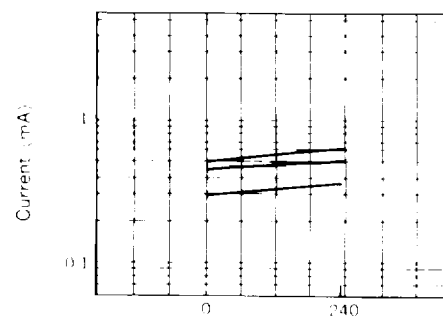
ESR change



ESR change



Current at 30 minutes change



Current at 30 minutes change

TYPICAL PERFORMANCE DATA (Continued)

Load life test (condition: 70±2 °C, 5.5 Vdc rated, 1,000 hours, n=20)

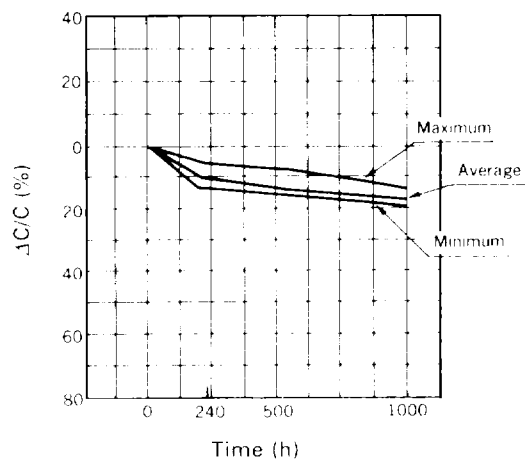


Figure 13. Capacitance change

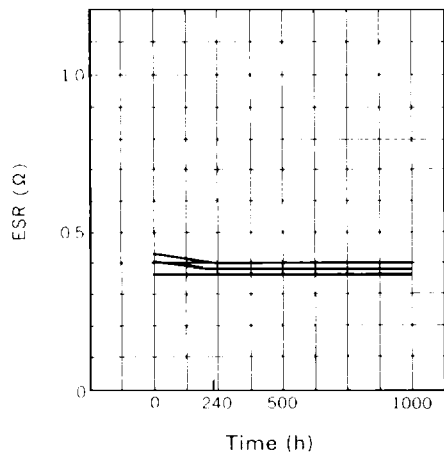
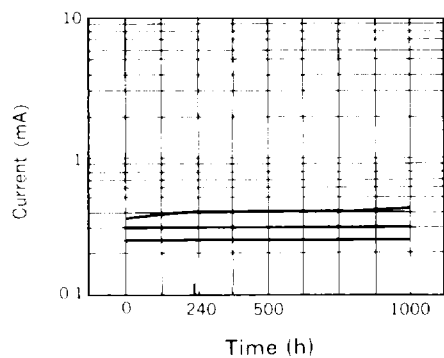


Figure 14. ESR change



Current at 30 minutes change

Charge discharge cycle

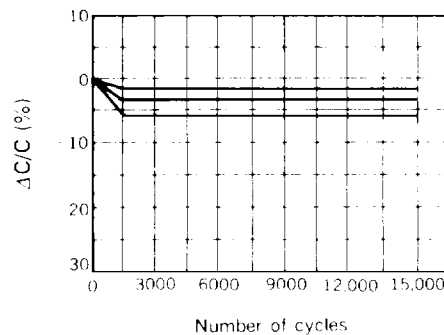
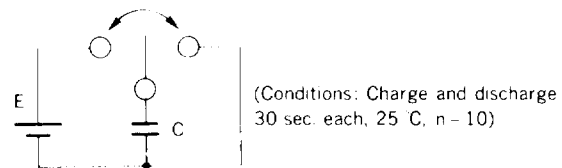


Figure 16. Capacitance change

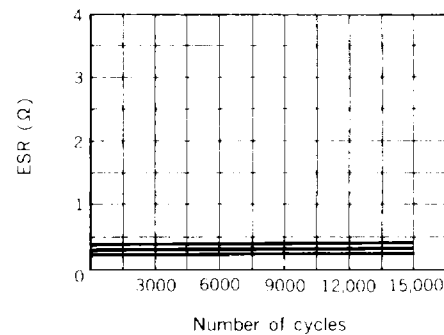
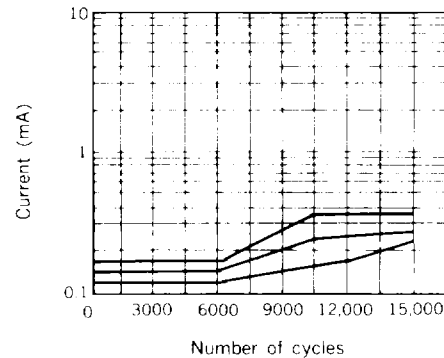


Figure 17. ESR change



Current at 30 minutes change