FR Series Wide Temperature Range Capacitor [–40˚C to +85˚C]

The FR series Super Capacitors are small-size electric double-layer capacitors that can operate in a temperature range as wide as –40˚C to +85˚C.
These capacitors are ideal as long-time backup devices for minute current loads in industrial equipment such as measuring instruments, control equipment, and communications equipment.

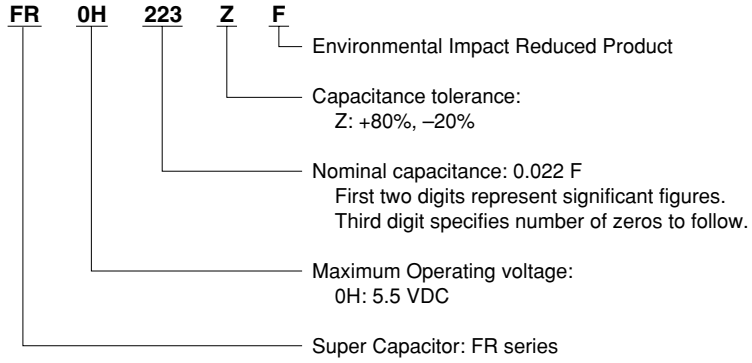
Features

- Wide operating temperature range: –40˚C to +85˚C
- High reliability (load life of 85˚C, 5.5 V, 1000 hours guaranteed)
- Excellent voltage holding characteristics ideal for long-time current supply of 1 μA to several hundred μA

Applications

Backup of CMOS microcomputers, static RAMs, and DTSs (digital tuning systems)

Part Number System



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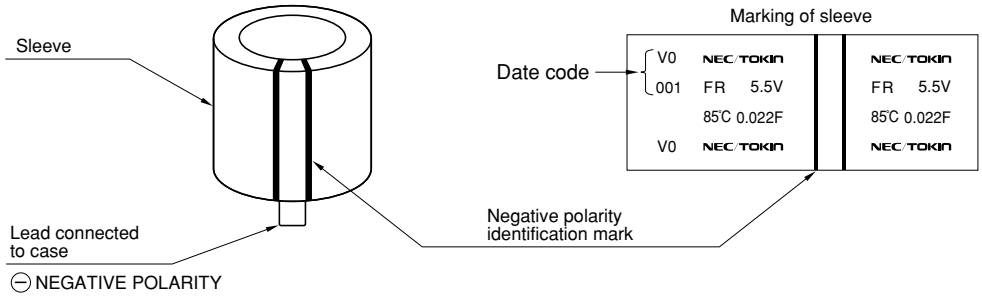
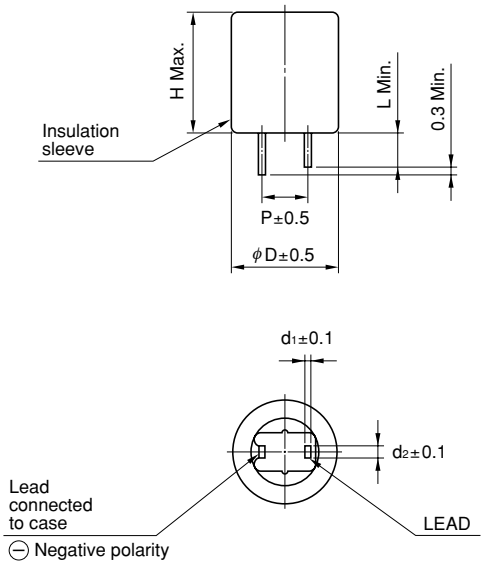
Markings



Dimensions



Part No.	Dimensions mm (inch)						Weight
	D	H	P	d_1	d_2	L	g (oz)
FR0H223ZF	11.5 (0.453)	14.0 (0.551)	5.08 (0.200)	0.4 (0.016)	1.2 (0.047)	2.7 (0.106)	2.3 (0.081)
FR0H473ZF	14.5 (0.571)	14.0 (0.551)	5.08 (0.200)	0.4 (0.016)	1.2 (0.047)	2.4 (0.095)	3.9 (0.138)
FR0H104ZF	14.5 (0.571)	15.5 (0.610)	5.08 (0.200)	0.4 (0.016)	1.2 (0.047)	2.4 (0.095)	4.3 (0.152)
FR0H224ZF	14.5 (0.571)	21.0 (0.827)	5.08 (0.200)	0.4 (0.016)	1.2 (0.047)	2.4 (0.095)	5.3 (0.187)
FR0H474ZF	16.5 (0.650)	21.5 (0.846)	5.08 (0.200)	0.4 (0.016)	1.2 (0.047)	2.7 (0.106)	7.5 (0.265)
FR0H105ZF	21.5 (0.850)	22.0 (0.866)	7.62 (0.300)	0.6 (0.024)	1.2 (0.047)	3.0 (0.118)	13.3 (0.470)

Note: Weight is typical.

Standard Ratings

Part Number	Max. Operating Voltage (V)	Nominal Capacitance		Max. ESR (at 1 kHz) (Ω)	Max. Current at 30 minutes (mA)	Voltage Holding Characteristic Min. (V)
		Charge System (F)	Discharge System (F)			
FR0H223ZF	5.5	0.022	0.028	220	0.033	4.2
FR0H473ZF	5.5	0.047	0.060	110	0.071	4.2
FR0H104ZF	5.5	0.10	0.15	150	0.15	4.2
FR0H224ZF	5.5	0.22	0.33	180	0.33	4.2
FR0H474ZF	5.5	0.47	0.75	100	0.71	4.2
FR0H105ZF	5.5	1.0	1.6	60	1.5	4.2

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Specifications: FR Series

Item		Specifications		Test Conditions Conforming to JIS C 5102-1994
Operating Temperature Range		–40˚C to +85˚C		
Maximun Operating Voltage		5.5 Vdc		
Nominal Capacitance Range		Refer to standard ratings		
Capacitance Allowance		+80 %, –20 %		Refer to characteristics measuring conditions
Equivalent Series Resistance		Refer to standard ratings		Refer to characteristics measuring conditions
Current (30-minute Value)		Refer to standard ratings		Refer to characteristics measuring conditions
Surge Voltage		Capacitance	More than 90 % of initial requirement	Conform to 7.14 Surge voltage 6.3 V Temperature : 85± 2˚C Charge: 30 sec. Discharge: 9 min. 30 sec. 1 000 cycles Charge resistance: 0.022 F 560 Ω 0.047 F 300 Ω 0.10 F 150 Ω 0.22 F 56 Ω 0.47 F 30 Ω 1.0 F 15 Ω Discharge resistance: Not applicable (0 Ω)
		Equivalent Series Resistance	Not to exceed 120 % of initial requirement	
		Current at 30 minutes	Not to exceed 120 % of initial requirement	
Temperature Variation of Characteristics	Phase 2	Capacitance	More than 50 % of initial value	Conform to 7.12 Phase 1: +25±2˚C Phase 2: –25±2˚C Phase 3: –40±2˚C Phase 4: +25±2˚C Phase 5: +85±2˚C Phase 6: +25±2˚C
		Equivalent Series Resistance	Not to exceed 4 times initial value	
	Phase 3	Capacitance	More than 30 % of initial value	
		Equivalent Series Resistance	Not to exceed 7 times initial value	
	Phase 5	Capacitance	Not to exceed 200 % of initial value	
		Equivalent Series Resistance	Not to exceed initial requirement	
		Current at 30 minutes	Not to exceed 1.5 CV (mA)	
	Phase 6	Capacitance	Within ±20 % of initial value	
		Equivalent Series Resistance	Not to exceed initial requirement	
		Current at 30 minutes	Not to exceed initial requirement	
Lead Strength (Tensile)		No loosening nor permanent damage of the leads		Conform to 8.1.2 (1) 0.022 to 0.47 F: 1 kg, 10 sec. 1 F: 2.5 kg, 10 sec.
Vibration Resietance		Capacitance	Meet initial requirement	Conform to 8.2.3 Frequency: 10 to 55 Hz Test duration: 6 hours
		Equivalent Series Resistance	Meet initial requirement	
		Current at 30 minutes	Meet initial requirement	
Solderability		3/4 or more of the pin surface shoud be covered with new solder		Conform to 8.4 245 ± 5˚C 5 ± 0.5 sec. 1.6 mm from body
Soldering Heat Resistance		Capacitance	Meet initial requirement	Conform to 8.5 260 ±10˚C, 10 ±1 sec. Immersion depth: 1.6 mm from body
		Equivalent Series Resistance	Meet initial requirement	
		Current at 30 minutes	Meet initial requirement	
Temperature Cycle		Capacitance	Meet initial requirement	Conform to 9.3 Temperature condition: –40˚C → normal temperature → +85˚C → normal temperature Number of cycles: 5 cycles
		Equivalent Series Resistance	Meet initial requirement	
		Current at 30 minutes	Meet initial requirement	
Humidity Resistance		Capacitance	Within ± 20% of initial value	Conform to 9.5 40 ± 2˚C, 90 to 95% RH 240 ± 8 hours
		Equivalent Series Resistance	Not to exceed120 % of initial requirement	
		Current at 30 minutes	Not to exceed120 % of initial requirement	

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Item	Specifications		Test Conditions Conforming to JIS C 5102-1994	
High Temperature Load	Capacitance change	Within ±30% of initial value	Conforms to 9.10 Temperature: 85 ± 2°C Series resistance: 0 Ω Applied voltage: 5.5 VDC Time of test: 1000 $^{+48}_{-0}$ hours	
	Equivalent Series Resistance	Not to exceed 200% of initial requirement		
	Current at 30 minutes	Not to exceed 200% of initial requirement		
Voltage Holding Characteristics	Voltage between terminal leads higher than 4.2V		Charging	(1) Applied Voltage: 5.0 V (2) Series Resistance: 0 Ω (3) Charging time: 24 h
			Storege	(1) Load: Nothing (2) Temp.: Less than 25°C (3) Humidity: Less than 70% RH (4) Storage time: 24 h

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