

POWER RELAY

ULTRA SMALL HIGH VOLTAGE DC RELAY

FTR-J2 Series

RoHS Compliant

■ FEATURES

- 10A, 450VDC high-voltage switching (2 x 10A, 200VDC switching)
- Contact voltage drop: Typical 0.1V
- Inrush current 150A (capacitive loads)
- Compact size (L x W x H = 24 x 23.5 x 27 mm)
- 1a (1 Form A) x 2
- High insulation (between contacts and coil)
 - Insulation distance: Clearance/creepage $\geq 6\text{mm}$
 - Dielectric strength: 4,000VAC
 - Surge strength: 10,000V (1.2 x 50 μ sec.)
- Plastic materials conform to UL94 flame class V-0
- Flux proof, RTII
- RoHS compliant



■ APPLICATIONS

HVDC power supply system, uninterruptible power supply (UPS), EV precharge circuits etc.

■ PART NUMBERS

[Example] FTR-J2 A K 012 W
 (a) (b) (c) (d) (e)

(a)	Relay type	FTR-J2 series
(b)	Contact configuration	A : 1a (1 Form A) x 2
(c)	Coil power	K : Standard sensitivity
(d)	Coil rated voltage	012 : 5....24VDC Please refer to coil rating table
(e)	Contact material	W : Silver alloy

Actual marking does not carry the type name: "FTR"

E.g.: Ordering code: "FTR-J2AK012W", actual marking: "J2AK012W"

■ SPECIFICATIONS

Item			Specifications	Remarks/Conditions
Contact Data	Configuration		1a (1 Form A) x 2	
	Material		Silver alloy	
	Resistance		Max. 100mΩ	At 1A, 6VDC between contact terminals ^{Note 1}
	Contact rating		10A, 450VDC (resistive load)	When 2 contacts connected in series through a common load
			10A, 200VDC (resistive load)	When each NO contact is used independently
	Overload switching		10A, 500VDC (resistive load) 50 ops.	When 2 contacts connected in series through a common load
			10A, 250VDC (resistive load) 50 ops.	When each NO contact is used independently
	Max. carrying current		12A per contact	2 contacts connected in series through a common load is counted as 1 contact ^{Note 2}
	Inrush current		Peak 150A per contact	2 contacts connected in series through a common load is counted as 1 contact ^{Note 2}
	Max. switching voltage		600VDC	When 2 contacts connected in series through a common load
			300VDC	When each NO contact is used independently
	Contact voltage drop (initial)		Max. 0.1V per contact	At 10A, between contact terminals ^{Note 1}
Min. switching load *		100mA 5VDC per contact	2 contacts connected in series through a common load is counted as 1 contact ^{Note 2}	
Coil	Rated power		530mW	Standard single coil at 20°C (Please refer to Coil Rating for 2 coils)
	Operating temperature range		-40°C to +85°C	No frost ^{Note 3}
Time	Operate		Max. 15ms (without bounce)	At nominal voltage, 20°C, with varistor
	Release		Max. 5ms (without bounce)	
Life	Mechanical		Min. 2M operations per contact	2 contacts connected in series through a common load is counted as 1 contact ^{Note 2}
	Electrical (resistive)		Min. 10K operations per contact	2 contacts connected in series through a common load is counted as 1 contact ^{Note 2}
Insulation	Insulation resistance		Min. 1,000MΩ	At 500VDC
	Dielectric strength	Open contacts	1,000VAC (50/60Hz), 1 minute ^{Note 2}	
		Adjacent contacts	1,000VAC (50/60Hz), 1 minute ^{Note 1}	
		Coil to contacts	400VAC (50/60Hz), 1 minute ^{Note 2}	
	Surge strength	Coil to contacts	10,000V / 1.2 x 50μs standard wave ^{Note 2}	
Others	Vibration resistance	Misoperation	10 to 55 to 10Hz single amplitude 0.75mm	Coil ON/OFF, 3 axis, total 6 cycles
		Endurance	10 to 55 to 10Hz single amplitude 0.75mm	Coil OFF, 3 axis, total 6 hours
	Shock resistance	Misoperation	Min. 200m/s ² (11±1ms)	Coil ON/OFF, 3 axis, total 36 operations
		Endurance	Min. 1,000m/s ² (6±1ms)	Coil OFF, 3 axis, total 18 operations
	Dimensions / Weight		23.5 x 24.0 x 28.0 mm / approx. 26g	
	Sealing		Flux proof RT II	

Values of electrical characteristics are under 15 to 35°C, 25 to 75%RH, air pressure 86kPa to 106kPa (JIS standard condition) unless otherwise specified.

* Minimum switching loads mentioned above are reference values. Please perform the confirmation test with actual load before production since reference values may vary according to switching frequencies, environmental conditions and expected reliability levels.

Note 1: The specification value is applied to each contact in case 2 coils are connected in series through a common load.

Note 2: The contacts connected in series are considered as an integrated contact in case 2 coils are connected in series through a common load.

Note 3: There are cases where the relay does not operate when it is used at high ambient temperature. Please refer to characteristic data and apply adequate coil voltage.

❗ There would be a possibility that high voltage DC relay loses breaking current ability as one of failure modes. Please provide fail safeness design on the circuit. To secure safety, the relay shall not be used in exceeding its specifications including operation life, and handle the relay as a periodic maintenance component.

❗ Relay contact terminals have polarity. Please connect higher potential side of the load to (+). Please refer to recommended circuit layout.

❗ Please always use a varistor to protect the coil from back electromotive force. Use of other protection element may shorten relay life excessively.

❗ Varistor shall be connected in parallel to the relay coil. Please refer to recommended circuit layout. Varistor voltage shall have 3 times as high as applied coil voltage.

❗ Care shall be taken on the heat generated on PC board when maximum carrying current exceeds 10A. Please perform the confirmation test with actual conditions.

■ COIL DATA

● Standard single coil

Coil Code	Rated Coil Voltage (VDC)	Coil Resistance (Ω) $\pm 10\%$	Must Operate Voltage (VDC)	Must Release Voltage (VDC)	Rated Power (mW)
005	5	47	3.5	0.25	Approx.530
006	6	68	4.2	0.3	
012	12	270	8.4	0.6	
024	24	1,100	16.8	1.2	

● 2 coils in series (Connect relay coil terminal No.2 to No.3) See note 2

Coil Code	Rated Coil Voltage (VDC)	Coil Resistance (Ω) $\pm 10\%$	Must Operate Voltage (VDC)	Must Release Voltage (VDC)	Rated Power (mW)
005	10	94	7.0	0.5	Approx.1,060
006	12	136	8.4	0.6	
012	24	540	16.8	1.2	
024	48	2,200	33.6	2.4	

● 2 coils in parallel (Connect relay coil terminal No.1 to No.3 and No.2 to No.4)

Coil Code	Rated Coil Voltage (VDC)	Coil Resistance (Ω) $\pm 10\%$	Must Operate Voltage (VDC)	Must Release Voltage (VDC)	Rated Power (mW)
005	5	23.5	3.5	0.25	Approx.1,060
006	6	34	4.2	0.3	
012	12	135	8.4	0.6	
024	24	550	16.8	1.2	

Note 1: All values in the tables are valid for 20°C and zero contact current.

Note 2: Nominal voltage is different from indication of part number

Note 3: Please use at rated coil voltage. Please refer to characteristic data and set up adequate voltage in case of use at over voltage.

* Specified operate values are valid for pulse wave voltage.

■ SAFETY STANDARDS

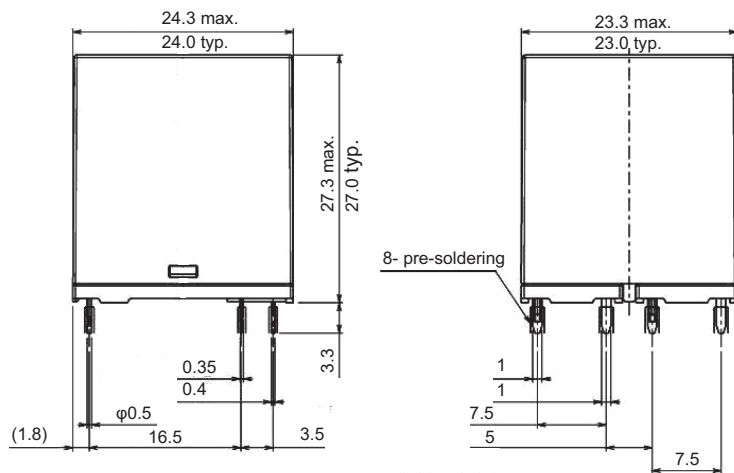
Type	Compliance	Contact Rating
UL	UL508 File No. E63615	10A, 450VDC, resistive, 10,000 cycles for series connection of each NO contact 10A, 400VDC, resistive, 10,000 cycles for series connection of each NO contact 10A, 200VDC, resistive, 10,000 cycles for each NO contact
VDE	IEC/EN61810-1	10A, 400VDC, resistive, 10,000 cycles for series connection of each NO contact 10A, 200VDC, resistive, 10,000 cycles for each NO contact

■ PART NUMBER LIST

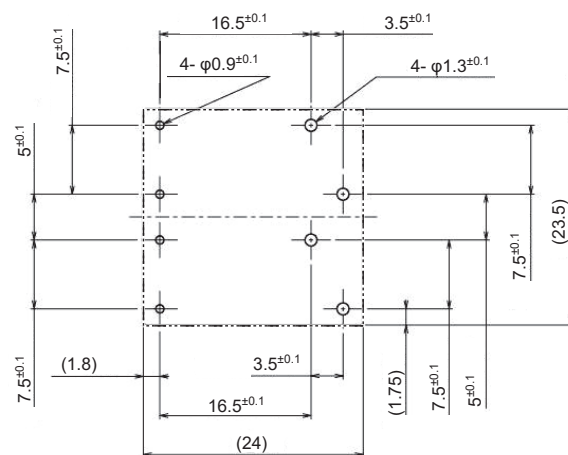
Part Number	Contact Configuration	Contact Rating	Contact Material	Rated Power
FTR-J2AK()W	1a (1 Form A) x 2	10A, 450VDC (series connection of each NO contact) 10A, 200VDC (each NO contact)	Silver alloy	530mW (Standard, single coil) 1,060mW (2 coils in series or 2 coils in parallel)

■ DIMENSIONS

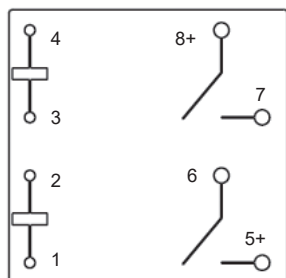
• Dimensions



• PC board mounting hole layout (BOTTOM VIEW)



■ SCHEMATICS



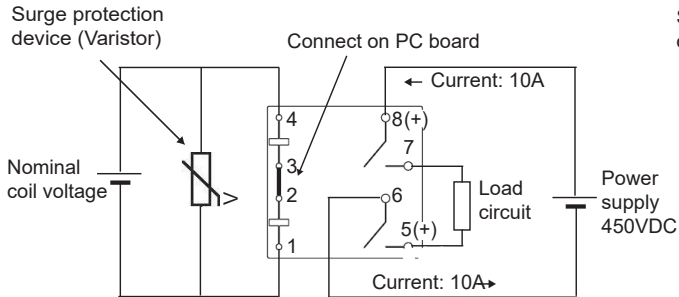
(BOTTOM VIEW)

- ❗ Relay contact terminals have polarity. Please connect higher potential side of the load to (+).
- ❗ Please always use a varistor to protect the coil from back electromotive force. Use of other protection element may shorten relay life excessively. Varistor must connect in parallel to the relay coil. Please refer to Recommended Circuit.

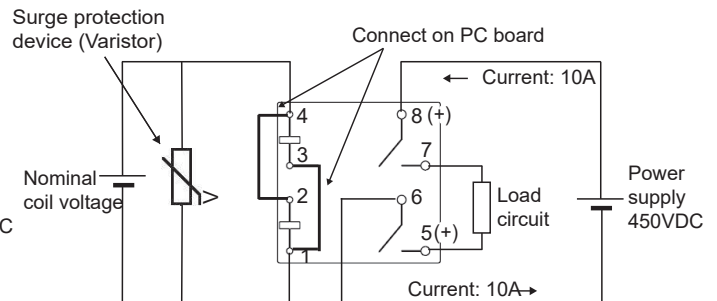
■ RECOMMENDED CIRCUIT

(2 CONTACTS CONNECTED IN SERIES UNDER THE SAME COMMON LOAD)

- Load circuit and input circuit (coil sides) for 10A 450VDC (2 coils connect in series)



- Load circuit and input circuit (coil sides) for 10A 450VDC (2 coils connect in parallel)



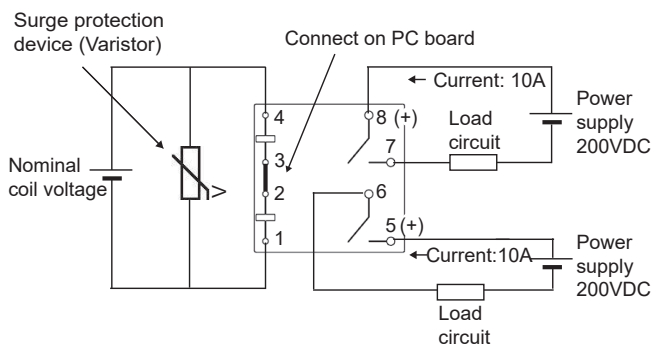
Load circuit contact terminals has polarities (+) and (-). Coils do not have polarity.

(BOTTOM VIEW)

■ RECOMMENDED CIRCUIT

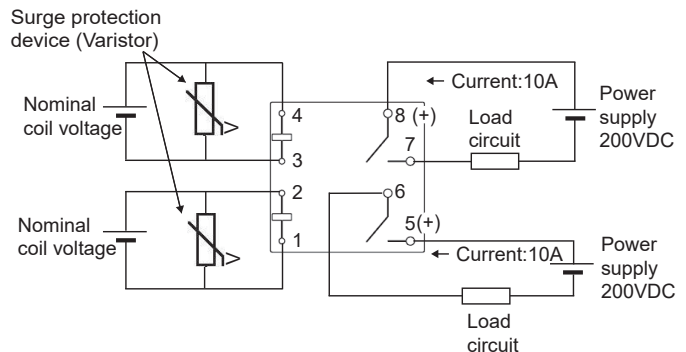
(EACH CONTACT IS USED INDEPENDENTLY)

- Load circuit and input circuit (coil sides) for 10A, 200VDC (dual circuit) 2 coils connect in series



Load circuit contact terminals has polarities (+) and (-). Coils do not have polarity.

- Load circuit and input circuit (coil sides) for 10A, 200VDC (dual circuit) Each coil is used independently



(BOTTOM VIEW)

Note 1: In case 2 coils are connected in series, connect coil terminal #2 to #3 on PCB circuit. In case 2 coils are connected in parallel, connect coil terminal #1 to #3 and connect coil terminal #2 to #4 on PCB. Regarding terminal number, refer to schematics data.

Note 2: Please use varistor as surge protection device. If varistor will not be used, the electrical life need to be derated.

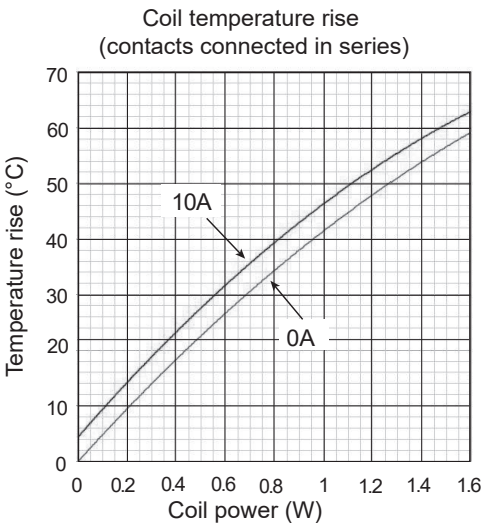
Note 3: Varistor surge protection device should be connect parallel to coil(s). Suitable voltage of varistor is 3 times the coil voltage.

Note 4: For max. contact life and correct functioning of the relay, positive polarity of load should be connected to pin 8 and pin 5. If not, damage to the relay can occur.

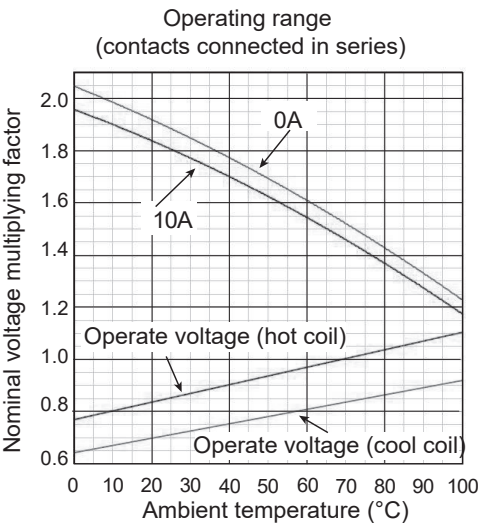
! Warning: At current loads at max. switching capacity 10A (200VDC) correct polarity is vital for the correct and safe functioning of the relay.

■ CHARACTERISTIC DATA

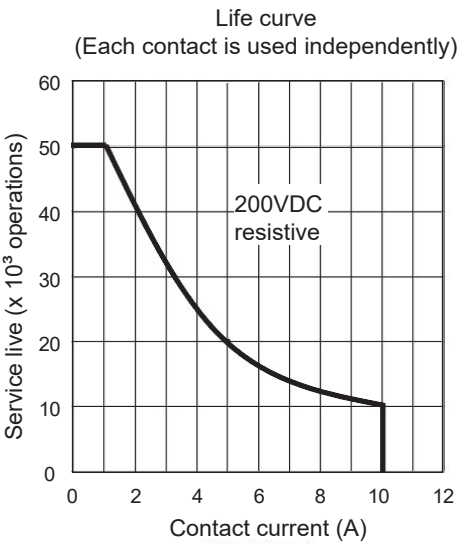
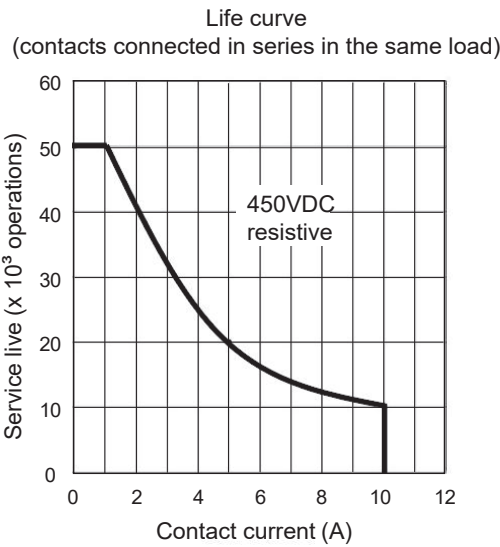
(Characteristic data is not guaranteed value but measured values of samples from production line.)



Note: When each contact is used independently, above graph shall be read; same voltage is applied on 2 coils, coil power is sum of 2 coils, applied current 10A is 10A apply on each contact set.



Note: When each contact is used independently, above graph shall be read; same voltage is applied on 2 coils, applied current 10A is 10A apply on each contact set.



■ WARNING



We highly recommend to use the circuit layouts on this datasheet to switch 10A, 450VDC or 10A, 200VDC.

Polarity of the terminals shall be kept as specified, otherwise fire or electric shock may occur. There would be a possibility that high voltage DC relay loses breaking current ability as one of failure modes. Please provide fail safeness design on the circuit not to result in any injury or deaths or damages. To secure safety, the relay shall not be used in exceeding its specifications including operation life, and handle the relay as a periodic maintenance component.

■ CAUTION

- ❗ Each coil shall be synchronized completely in case 2 coils are used separately at 10A 450VDC switching. Incomplete synchronization may shorten relay life excessively.
- ❗ Magnetic field is generated on the top surface of relay. Please consider its influence to other components. When 2 or more relays are mounted quite closely, please confirm operation before actual use.
- ❗ All values mentioned in this datasheet are provided under ideal conditions. Please perform the confirmation test before actual use.
- ❗ Reflow soldering is prohibited.
- ❗ Do not use FTR-J2 relays for automotive applications.
- ❗ Do not use relays in the atmosphere with sulfide gas, chloride gas or nitric oxide. Contact resistance may increase.
- ❗ Do not use silicon or silicon-containing product or materials near relays. It may cause contact failure.

GENERAL INFORMATION

1. General information

- All relays produced by FCL Components are compliant with RoHS directive 2011/65/EU, including commission delegated directive 2015/863.

2. Recommended lead free solder condition

- Lead free solder plating on relay terminals is Sn-3.0Ag-0.5Cu, unless otherwise specified. This material has been verified to be compatible with PbSn assembly process.
- Recommended solder for assembly: Sn-3.0Ag-0.5Cu.

Flow Solder Condition:

Pre-heating: Maximum 120°C within 90 sec.

Soldering: Dip within 5 sec. at 255°C±5°C solder bath

Relay must be cooled by air immediately after soldering

Solder by Soldering Iron:

Soldering Iron: 30-60W

Temperature: Maximum 340-360°C

Duration: Maximum 3 sec.

We highly recommend that you confirm your actual solder conditions

3. Moisture Sensitivity

- Moisture Sensitivity Level standard is not applicable to electromechanical relays, unless otherwise
- indicated.

4. Tin Whiskers

- Dipped SnAgCu solder is known as presenting a low risk to tin whisker development. No considerable length whisker was found by our in house test.

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