HIGH VOLTAGE DC SWITCHING RELAY

MAX. 1,000VDC BREAK HIGH CAPACITY DC POWER RELAY - 60A CARRYING CURRENT

FTR-E1-HC Series

RoHS Compliant

■ FEATURES

- 60A, 450VDC / 10A, 1,000VDC high voltage DC load switching
- Non polarized contacts. Switchable for charge/discharge circuit
- Low coil power consumption (1,200mW at coil rated voltage)
- High insulation
  - Between coil and contact: 5,000VAC, 1 minute
  - Between open contact: 2,500VDC, 1 minute
- cULus, TUV approved
- Plastic material: UL flammability 94V-0
- Plastic sealed



■ APPLICATIONS

Electric vehicles (HEV, PHEV, EV), fast charge stations, photovoltaic power generation systems, hybrid construction machineries, battery systems, etc.

■ PART NUMBERS

[Example] FTR-E1 A A 012 Y - HC

(a) (b) (c) (d) (e) (f)

(a)	Relay type	FTR-E1 series
(b)	Contact configuration	A : 1a (1 Form X)
(c)	Power consumption	A : Standard (1,200mW)
(d)	Nominal coil voltage	012 : 12VDC 024 : 24VDC
(e)	Contact material	Y : Silver alloy
(f)	Special type	HC : High capacity type

Note: The designation name is stamped on the top of the relay case as follows:

Example: Ordering part number: FTR-E1AA012Y-HC Stamped on part number: E1AA012Y-HC

■ SPECIFICATIONS

Item			Specifications	Remarks/Conditions
Contact Data	Configuration		1a (1 Form X)	
	Material		Silver alloy	
	Construction		Single contact	
	Contact rating		60A, 450VDC 10A, 1,000VDC	Resistive
	Voltage drop		Max. 0.5V	At 20A
	Max. carrying current		60A	At 85°C, cable size 14mm^2
	Min. switching load *1		1A, 6VDC	Reference
	Type of interruption		Micro-disconnection	
Coil	Rated power consumption		1,200mW	At 20°C
	Operate power consumption		588mW	At 20°C
	Operating temperature range		-40°C to +85°C	No frost
Time	Operate		Max. 30ms (without bounce)	At 20°C, at nominal voltage
	Release		Max. 10ms (without diode, without bounce)	
Life	Mechanical		500 x 10^3 operations	18,000 operations/hour
	Electrical		10 operations	10A inrush, 60A carrying current, 10A break, 1,000VDC resistive, with suppression device*2
			10 operations	20A, 800VDC resistive, with suppression device*2
			500 operations	60A, 450VDC, resistive, with suppression device*2
			100 x 10^3 operations	20A, 800VDC inrush only (without break)
Insulation	Insulation resistance		1,000MΩ	At 1,000VDC
	Dielectric withstanding voltage	Open contacts	2,500VAC (50/60Hz), 1 minute	
		Coil to contacts	5,000VAC (50/60Hz), 1 minute	
	Surge strength	Coil to contacts	10,000V	Initial, reference
	Clearance	Coil to contacts	9.5mm	
	Creepage	Coil to contacts	12.7mm	
	Type of insulation	Coil to contacts	Reinforced	IEC60664-1
	Pollution degree		3	
Others	Vibration resistance	Misoperation	5 to 200Hz, 45m/s^2, constant acceleration	Sense time 1ms, contact ON/OFF
		Endurance	5 to 200Hz, 45m/s^2, constant acceleration	Contact ON/OFF, up/down 4hours, left/right/front/back each 2 hours
	Shock resistance	Misoperation	100m/s^2 (11±1ms)	Sense time 1ms
		Endurance	1,000m/s^2 (6±1ms)	Contact ON/OFF total 36 times
	Test procedure		Single mounting	
	Category of protection		RT III	IEC61810-1
	Dimensions / Weight		28.3 x 43.6 x 36.8 mm / Approx. 80g	

Note: Electrical characteristics mentioned above are the values at JIS standard condition (temperature 15 to 35°C, relative humidity 25 to 75%, atmospheric pressure 86k to 106kPa) unless otherwise specified.

Note: 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.

*1: 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.

*2 : Electrical life at resistive load mentioned above are the values when a varistor or zener diode or zener diode+diode is used as coil suppression device. Using protection device other than these, the contact life expectancy may decrease drastically.
When using a varistor as a suppression device, varistor voltage shall be approximately twice the voltage applied to the coil and connect it in parallel with the coil. When using a zener diode or zener diode+diode as a suppression device, please refer to the CIRCUIT DIAGRAM WHEN USING ZENER DIODE.

■ COIL DATA

Coil Code	Rated Coil Voltage (VDC)	Coil Resistance ±10% (Ω)	Must Operate Voltage*1 (VDC)	Must Release Voltage*1 (VDC)
012	12	120	8.4 (at 20°C) 10.5 (at 85°C)	1.0 (at 20°C) 1.3 (at 85°C)
024	24	480	16.8 (at 20°C) 21.2 (at 85°C)	2.0 (at 20°C) 2.6 (at 85°C)

Note: All values in the table are valid at 20°C and zero contact current, unless otherwise specified.

Note: Coil polarity must be applied as specified in schematics.

*: Specified operated values are valid for pulse wave voltage.

■ SAFETY STANDARDS

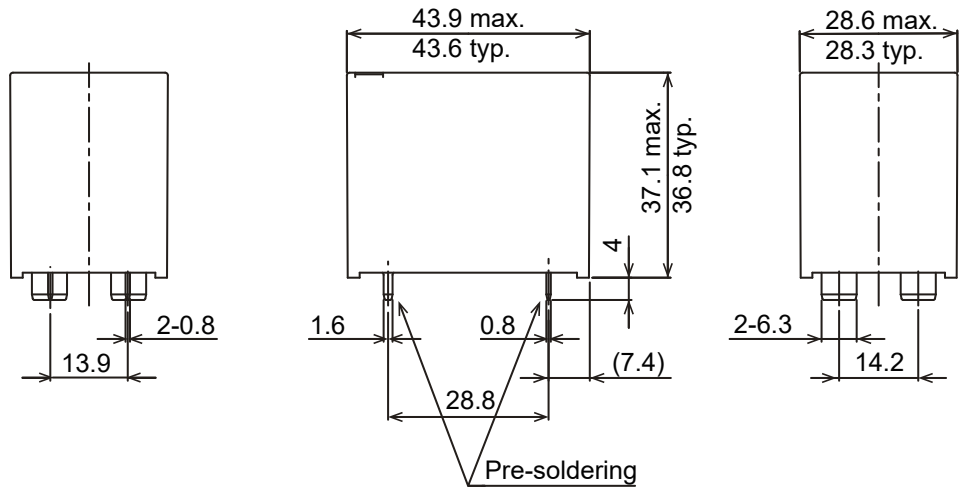
Type	Compliance	Contact Rating
cULus	UL508 C22.2 No. 14-13 (File No. E63615)	40A, 360VDC (resistive) 60°C
TUV	IEC61810-1	60A, 450VDC (resistive) 85°C

■ PART NUMBER LIST

Part Number	Nominal Coil Voltage	Contact Rating	Safety Standard
FTR-E1AA012Y-HC	12VDC	60A, 450VDC 10A, 1,000VDC	cULus TUV
FTR-E1AA024Y-HC	24VDC		

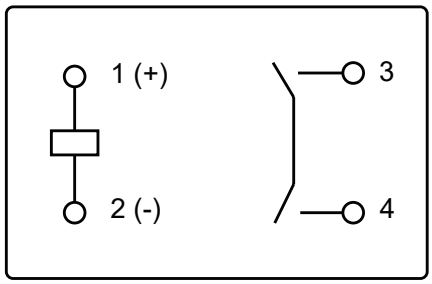
■ DIMENSIONS

● Dimensions

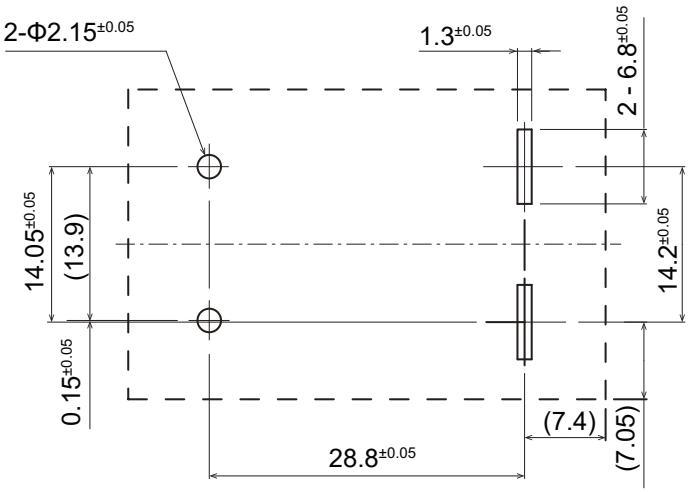


Note: Dimensions of the terminal do not include thickness of pre-soldering.

● Schematics (BOTTOM VIEW)



● PC board mounting hole layout (BOTTOM VIEW)

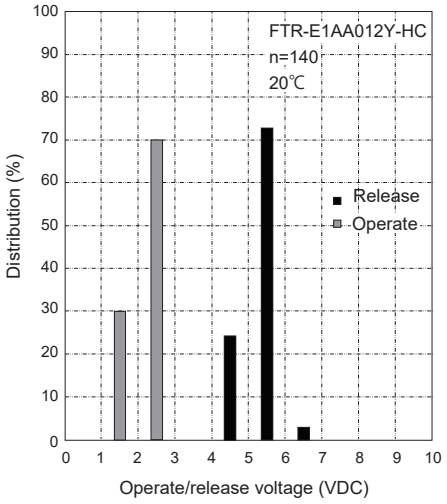


Unit: mm
( ): Reference

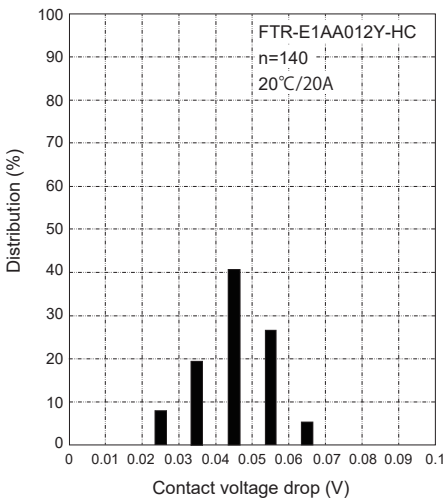
■ CHARACTERISTIC DATA

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

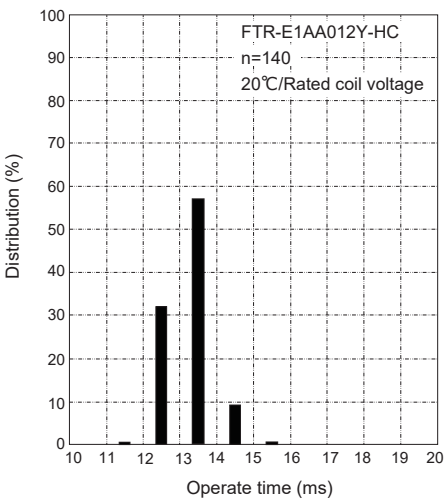
Distribution of operate/release voltage



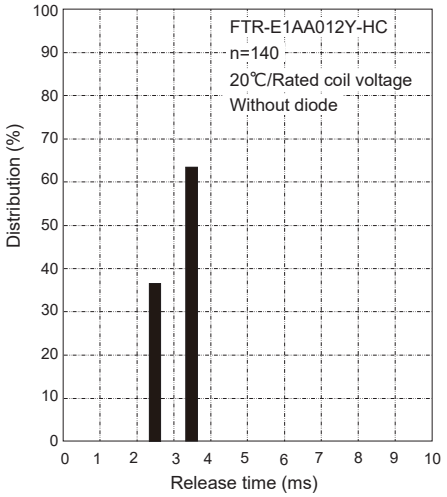
Distribution of voltage drop



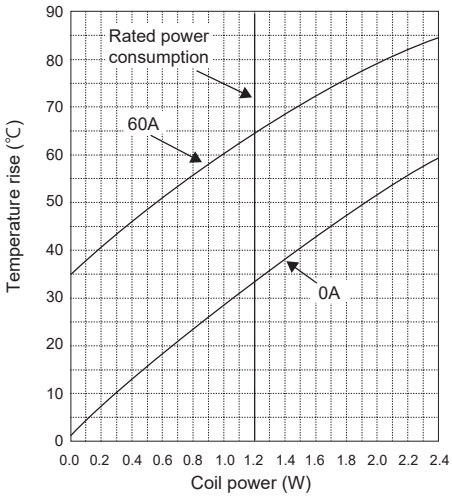
Distribution of operate time



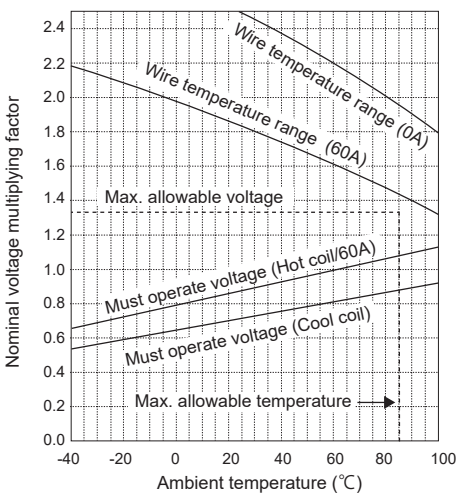
Distribution of release time



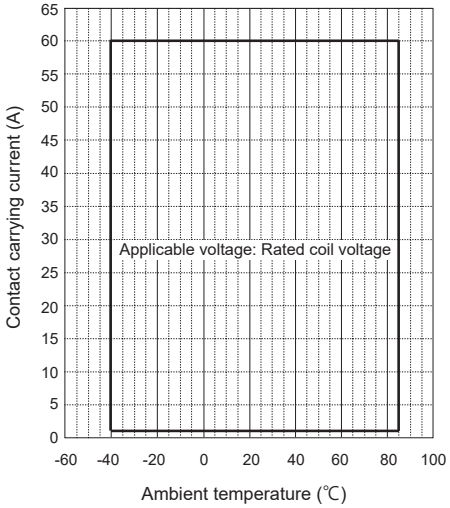
Coil temperature rise



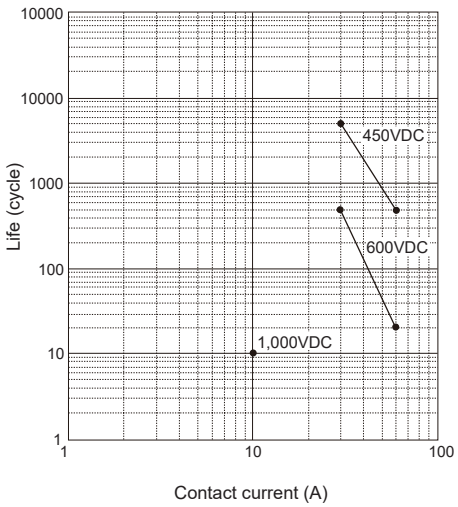
Operating range



Ambient temperature - contact carrying current



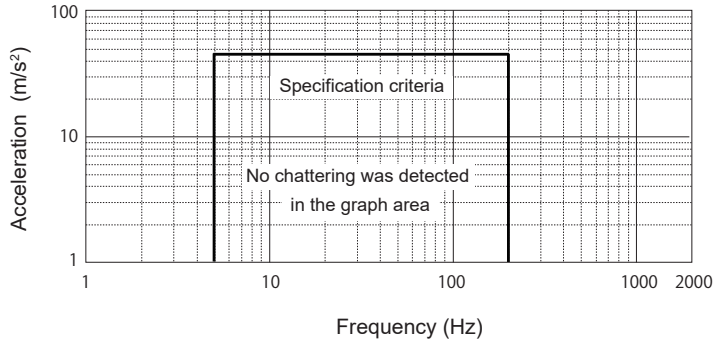
Switching life curve (resistive load)



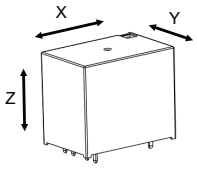
■ CHARACTERISTIC DATA

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

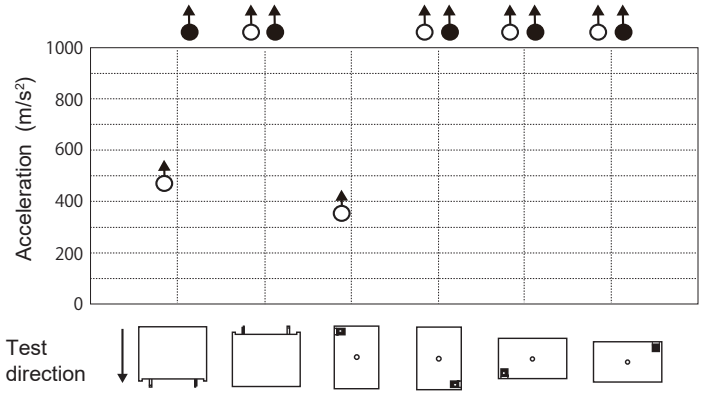
Vibration resistance characteristics



Test material: coil energized and de-energized
Direction of vibration: see diagram below
Detection level: chatter >1 ms



Shock resistance characteristics



Test material: coil energized and de-energized
Shock duration: 11ms (490m/s² or less)
6ms (more than 490m/s²)
Test direction: see diagram under the graph
Detection level: chatter > 1ms

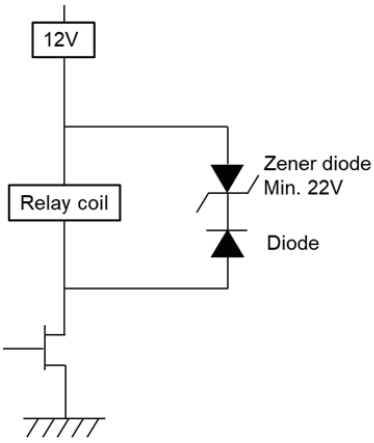
○ : Coil de-energized
● : Coil energized

■ CIRCUIT DIAGRAM WHEN USING ZENER DIODE

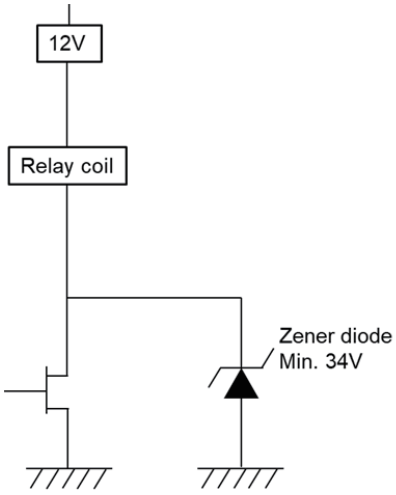
(Refer to *3 on page 2)

■ Nominal coil voltage: 12V

1. Using zener diode + diode

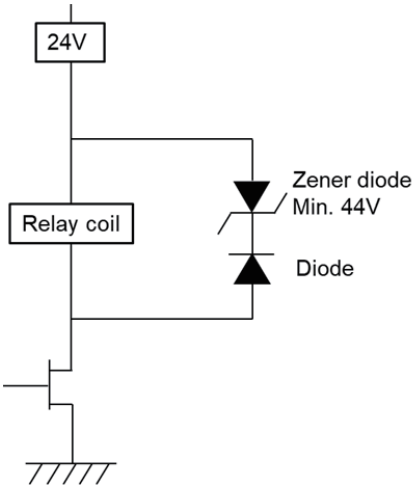


1. Using zener diode

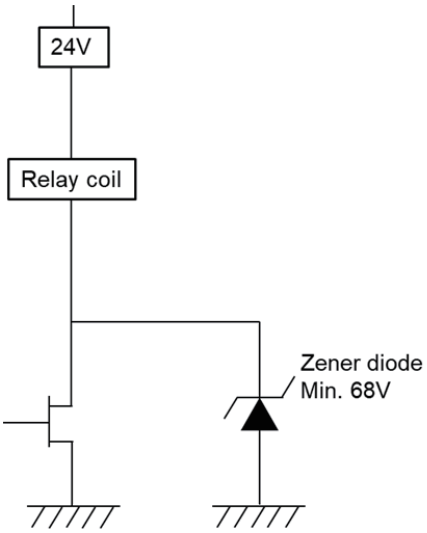


■ Nominal coil voltage: 24V

1. Using zener diode + diode



2. Using zener diode



CAUTIONS

- 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 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.
- Please connect relay coils according to specified polarity.

Cautions for high voltage DC switching relays

- There is a possibility that the relay is not able to switch off the load at high voltage DC load. Fail safe circuit must be provided to prevent injury, fire or other harms resulting from failure occurred on relays.
- Relays are periodic maintenance parts. Do not exceed the specified life time and/or switching conditions.

GENERAL INFORMATION

1. ROHS Compliance

- 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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