

# AUTOMOTIVE RELAY

## 1 POLE - 40A

### FBR53-LE Series

RoHS Compliant

#### ■ FEATURES

- The world smallest class\* ultra compact high power 40A relay
- Maximum inrush current 200A
- Maximum carrying current 54A (at 20°C, 1 hour)
- High temperature grade (-40°C to +125°C)
- Low coil power approx. 0.64W
- This relay is able to replace the Mini ISO relay
- Reflow capable (through hole reflow) type available
- Plastic sealed

\* Per internal investigation (December 2023)



#### ■ APPLICATIONS

Electric power steering, blower fan motor control, starter

#### ■ APPLICABLE LOADS

Resistive, inductive, capacitive

#### ■ PART NUMBERS

[Example] FBR53   N   D12 - Y - LE - RW  
 (a)   (b)   (c)   (d)   (e)   (f)

(a)	Relay type	FBR53 : FBR53 Series
(b)	Enclosure	N : Plastic sealed type
(c)	Coil rated voltage	D12 : 12VDC
(d)	Contact material	Y : Silver tin oxide
(e)	Contact rating	LE : 40A
(f)	Soldering	Nil : Standard (Flow soldering) RW : Reflow capable (THR)

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

E.g.: Ordering code: FBR52ND012Y-LE, actual marking: 53ND012-Y-LE

## ■ SPECIFICATIONS

Item		Specifications	Remarks/Conditions	
Contact Data	Configuration	1 Form U		
	Material	Silver tin oxide		
	Construction	Single		
	Rating	40A, 14VDC	Resistive	
	Max. carrying current <sup>*1</sup>	54A / 1 hour at 20°C		
	Fuse matching <sup>*1</sup>	54A / 30min at 20°C 50A / 30min at 85°C 47A / 30min at 125°C 80A / 1min at 20°C		
	Max. inrush current	200A	Reference	
	Min. switching load <sup>*2</sup>	1A, 12VDC	Reference	
	Voltage drop	Max. 100mV	At 1A 12VDC, initial	
Coil	Rated power consumption	640mW	At rated coil voltage, at 20°C	
	Operate coil power	237mW	At rated coil voltage, at 20°C	
	Operating temperature range <sup>*3</sup>	-40°C to +125°C		
Time	Operate	Max. 10ms	At rated coil voltage, without bounce	
	Release	Max. 5ms	At rated coil voltage, without bounce, without diode	
Life	Mechanical		Min. 1 x 10 <sup>6</sup> operations	
	Electrical	Resistive	Min. 100 x 10 <sup>3</sup> operations	14VDC, resistive load 50A
		Inductive	Min. 100 x 10 <sup>3</sup> operations	Inrush 47A, 14VDC, steady 10.5A
		Capacitive	Min. 100 x 10 <sup>3</sup> operations	Inrush 120A, 14VDC, steady 20A
Insulation	Insulation resistance		Min. 100MΩ	At 500VDC, initial
	Dielectric strength	Open contacts	500VAC (50/60Hz), 1 minute	Initial
		Coil-contacts	500VAC (50/60Hz), 1 minute	Initial
Others	Vibration resistance	Misoperation	10 to 200Hz, acceleration 44m/s <sup>2</sup> (4.5G) constant acceleration	Direction X, Y, Z, coil ON/OFF total 6 cycles
		Endurance	10 to 200Hz, acceleration 44m/s <sup>2</sup> (4.5G) constant acceleration	Direction X, Y, Z, coil OFF total 6 hours
	Shock resistance	Misoperation	100m/s <sup>2</sup> (11±1ms)	Direction X, Y, Z, coil ON/OFF total 36 times
		Endurance	1,000m/s <sup>2</sup> (6±1ms)	Direction X, Y, Z, coil OFF total 18 times
	Dimensions / Weight		12.1 x 15.5 x 13.7 mm / Approx. 6g	

\*1: The data for "Max. Carrying Current" and "Fuse matching" are based on an applied voltage of 14 VDC to the coil.

\*2: 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.

\*3: Relays shall be kept frost free.

**!** Care shall be taken on the heat generated on PC board when maximum carrying current exceed 10A.

## ■ COIL DATA

Coil Code	Rated Coil Voltage (VDC)	Coil Resistance $\pm 10\%$ ( $\Omega$ )	Must Operate Voltage* <sup>1</sup> (VDC)	Must Release Voltage* <sup>1</sup> (VDC)	Nominal Power (mW)
D12	12	225	7.3 (at 20°C) 10.4 (at 125°C)	1.0 (at 20°C) 1.5 (at 125°C)	Approx. 640

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

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

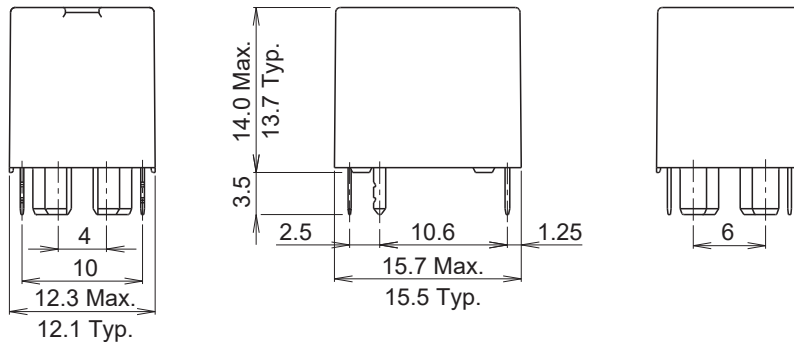
Note: Please use at rated coil voltage. Please refer to characteristic data and set up adequate voltage in case of use at over voltage.

## ■ PART NUMBER LIST

Part Number	Rated Coil Voltage	Contact Configuration	Nominal Power	Contact Material	Enclosure	Others
FBR53ND12Y-LE-RW	12VDC	1 Form U	640mW	Silver tin oxide	Plastic sealed	Reflow capable
FBR53ND12Y-LE						Flow soldering

## ■ DIMENSIONS

### • Dimensions



COM terminal: 2.2 x 0.25t

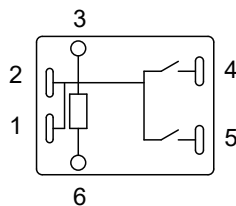
N.O. terminal: 2.2 x 0.4t

Coil terminal: 1.0 x 0.3t

tolerance  $\pm 0.1$

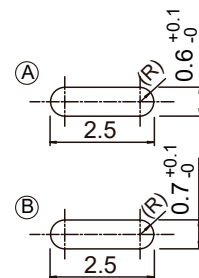
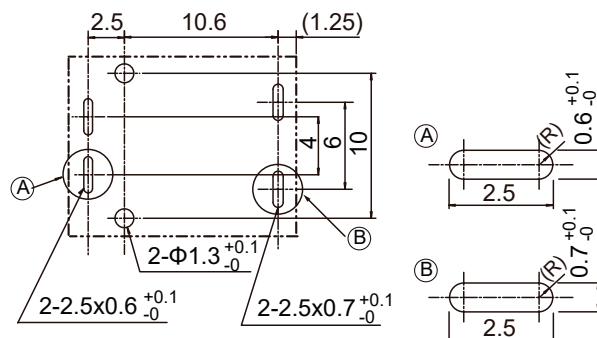
- Dimensions of the terminals do not include thickness of pre-soldering.
- Dimensions do not include tolerances.

### • Schematics (BOTTOM VIEW)



- Pattern shall be designed to short-circuit #4 and #5 on the PC board.

### • PC Board Mounting Hole Layout (BOTTOM VIEW)

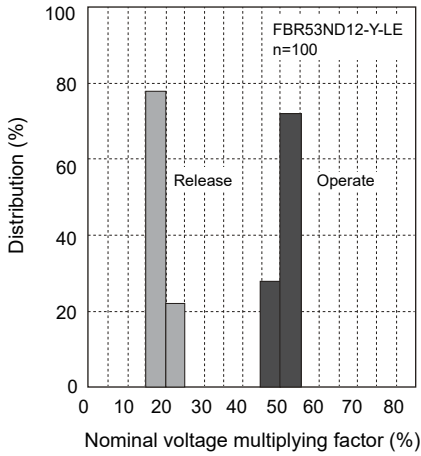


( ) : Reference  
Unit: mm

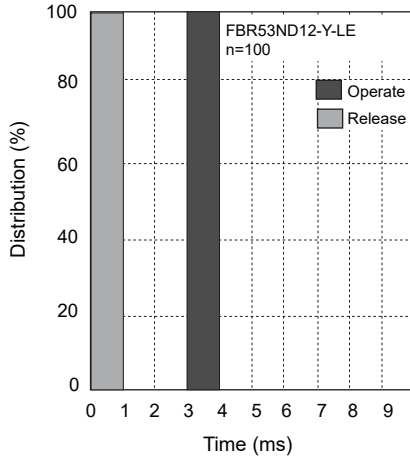
## CHARACTERISTIC DATA

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

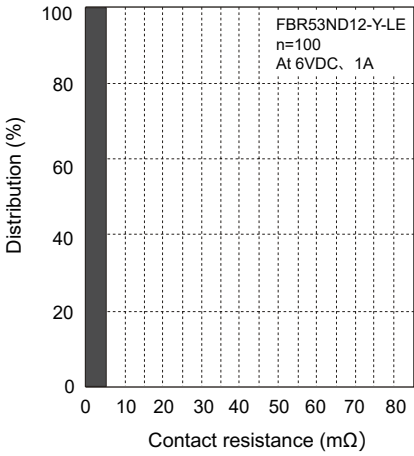
Distribution of operate/release voltage



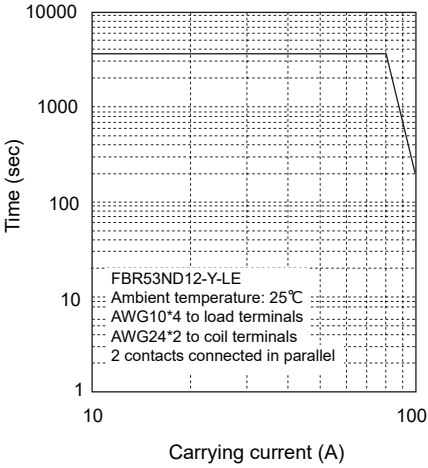
Distribution of operate/release time



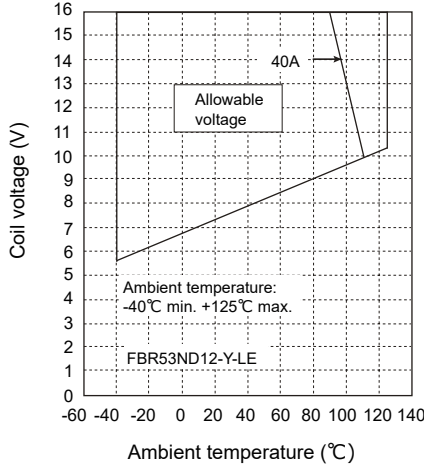
Distribution of contact resistance



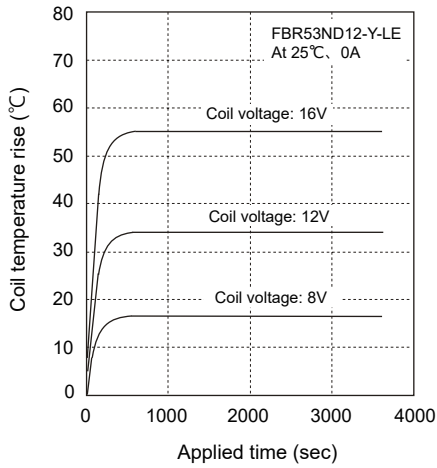
Contact current



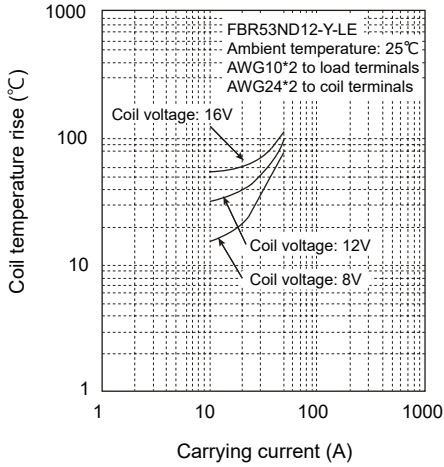
Ambient temperature/voltage



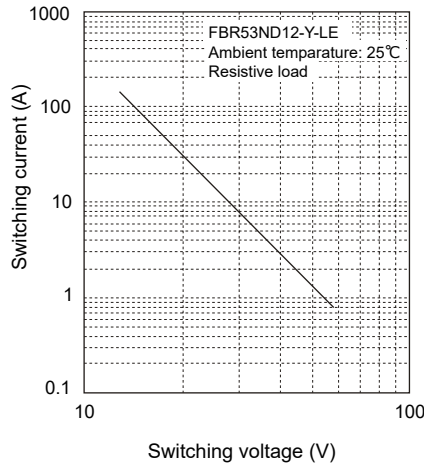
Coil temperature rise (1)



Coil temperature rise (2)



Max. allowable switching



## CAUTIONS

- All values mentioned in this datasheet are provided under ideal conditions. Please perform the confirmation test before actual use.
- Reflow soldering is prohibited for flow soldering type.
- 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. 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:

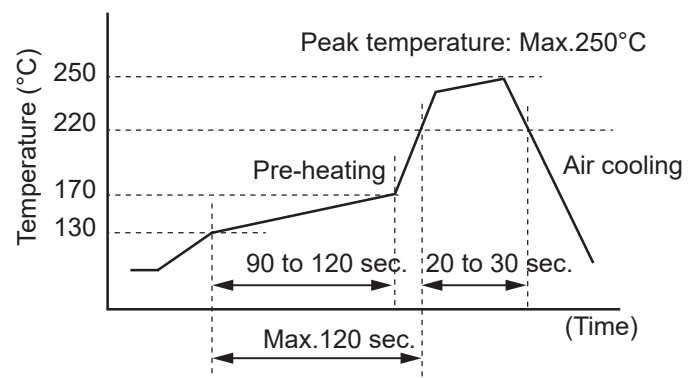
Pre-Heating: Maximum 120°C within 90 sec.  
 Soldering: Dip within 5 sec. at 255°C±5°C solder bath  
 Relay must be cooled by air immediately after soldering

#### Solder by Soldering Iron:

Soldering Iron: 30-60W  
 Temperature: maximum 340-360°C  
 Duration: maximum 3 sec.

#### Reflow Solder Condition:

(Applicable only for reflow capable type)  
 Recommended reflow soldering profile  
 IRS (infrared reflow soldering)



#### Important notes for reflow soldering

- Temperature shall be measured at PC board upper surface
- Temperature at PC board upper surface may be change of PC board, components mounted on the PC board and/ or heating method. Please perform the confirmation test with your actual PC board.
- This reflow solder condition is applicable only for reflow-capable relays. Do not reflow reflow-incapable relays.

**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.

## Contact

### Japan

FCL COMPONENTS LIMITED  
Shinagawa Seaside Park Tower  
12-4, Higashi-shinagawa 4-chome,  
Tokyo 140 0002, Japan  
Tel: +81-3-3450-1682  
Email: fcl-contact@cs.fcl-components.com

### North and South America

FCL COMPONENTS AMERICA, INC.  
2055 Gateway Place Suite 480,  
San Jose, CA 95110 USA  
Tel: +1-408-745-4900  
Email: fcmai.components@fcl-components.com

### Europe

FCL COMPONENTS EUROPE B.V.  
Diamantlaan 25  
2132 WV Hoofddorp, Netherlands  
Tel: +31-23-556-0910  
Email: info@fcl-components.eu

### Asia Pacific

FCL COMPONENTS ASIA PTE LTD.  
No. 20 Harbour Drive, #07-01B  
Singapore 117612  
Tel: +65-6375-8560  
Email: fcal@fcl-components.com

### China

FCL COMPONENTS (SHANGHAI) CO.,LTD.  
Unit 1105, Central Park - Jing An,  
No.329 Heng Feng Road, Shanghai  
200070, China  
Tel: +86-21-3253 0998  
Email: fcsh@fcl-components.com

### Hong Kong

FCL COMPONENTS HONG KONG CO.,  
LIMITED  
Unit 2313, Seapower Tower, Concordia  
Plaza, No.1 Science Museum Road,  
TST, Kowloon, Hong Kong  
Tel: +852-2881-8495  
Email: fcal@fcl-components.com

Web: [www.fcl-components.com/en/](http://www.fcl-components.com/en/)

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