

# COMPACT POWER RELAY

## 1 POLE - 25/30A (For automotive applications)

### FBR51, 52 Series

#### ■ FEATURES

- Compact and light weight structure
- High current contact capacity  
(carrying current: 35 A/10 minutes, 30 A/1 hour)
- High resistance to vibration and shock
- Improved heat resistance and extended operation range
- Two contact gap options  
(FBR51: 0.3 mm, FBR52: 0.6 mm)
- Three types of contact material



#### ■ Part Numbers

[Example]  $\frac{\text{FBR51}}{\text{(a)}} - \frac{\text{N}}{\text{(b)}} - \frac{\text{D12}}{\text{(c)}} - \frac{\text{W1}}{\text{(d)}}$

(a)	Relay type	FBR51 FBR52	: FBR51-Series - Standard type (contact gap 0.3mm) : FBR52-Series - Wide contact gap type (contact gap 0.6mm)
(b)	Enclosure	N	: Plastic sealed type
(c)	Coil rated voltage	D12	: 6...12VDC Coil rating table at page 3
(d)	Contact material	W1 WL WF	: Silver-tin oxide indium (high power type, 1 form C) : Silver-tin oxide indium (lamp loads, 1 form A, FBR51 only) : Silver-tin oxide indium (flasher loads, 1 form A, FBR51 only)

Actual marking does not carry the type name: "FBR"  
E.g.: Ordering code: "FBR51ND12-W1", actual marking: "51ND12-W1"

# FBR51, 52 Series

## ■ Specifications (for motor load)

Item			Characteristics W1 contact	Remarks / conditions
Contact data	Configuration		1 form C (SPDT)	
	Material		AgSnO2In (high capacity type)	
	Voltage drop		Max. 100mV	At 1A/12VDC
	Contact rating		25A, 14VDC	At locked motor load
	Max. carrying current		35A / 10 min., 30A 1hr	
	Max. inrush current		60A	Reference
	Max. switching voltage		16VDC	Reference
	Max. switching power		35A	Reference
	Min. switching load *1		1A 6VDC	Reference
Coil	Storage temperature range		40°C ~ +100°C	No frost
	Operating temperature range		-40°C ~ +85°C (At long continuous carry current conditions, refer to "operating coil voltage range" on page 7)	No frost
Timing data	Operate		Max. 10ms	At nominal voltage No diode, excluding bounce
	Release		Max. 5ms	At nominal voltage No diode, excluding bounce
Life	Mechanical	AC contact rating	Min. 10 x 10 <sup>6</sup> operations	
	Electrical (resistive)	DC contact rating	Min. 100 x 10 <sup>3</sup> operations	At contact rating, locked motor load
Other	Vibration resistance	Misoperation	10 to 200Hz, acceleration 44m/s <sup>2</sup> (4.5G) constant acceleration	Direction X, Y, Z, contact ON/OFF total 6 cycles
		Endurance	10 to 200Hz, acceleration 44m/s <sup>2</sup> (4.5G) constant acceleration	Direction X, Y, Z, contact OFF total 6 hours
	Shock resistance	Misoperation	Min. 100m/s <sup>2</sup> (11 ± 1ms)	Direction X, Y, Z, contact ON/OFF total 36 times
		Endurance	Min. 1,000m/s <sup>2</sup> (6 ± 1ms)	Direction X, Y, Z, contact OFF total 18 times
	Dimensions / weight		12.1 x 15.5 x 13.7 mm / approx. 6g	

\*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. 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.

# FBR51, 52 Series

## ■ Specifications (for lamp load)

Item			Characteristics		Remarks / conditions
			W1 contact	WL Contact	
Contact data	Configuration		1 form C (SPDT)		
	Material		AgSnO2In (for flasher)	AgSnO2In (for lamp)	
	Voltage drop		Max. 100mV		At 2A/12VDC
	Contact rating		14VDC, 80W	14VDC, 120W	At lamp load
	Max. carrying current		35A / 10 min., 30A 1hr		At 25 °C with nominal coil voltage
	Max. inrush current		60A		At lamp load, reference
	Max. switching voltage		16VDC		Reference
	Max. switching power		35A		Reference
	Min. switching load *1		1A 6VDC		Reference
Coil	Storage temperature range		40°C ~ +100°C		No frost
	Operating temperature range		-40°C ~ +85°C (At long continuous carry current conditions, refer to "operating coil voltage range" on page 7)		No frost
Timing data	Operate		Max. 10ms		At nominal voltage No diode, excluding bounce
	Release		Max. 5ms		At nominal voltage No diode, excluding bounce
Life	Mechanical	AC contact rating	Min. 10 x 10 <sup>6</sup> operations		
	Electrical (resistive)	DC contact rating	Min. 2.5 x 10 <sup>6</sup> operations at inrush 11A 14VDC (0.35 sec - ON/0.35 sec - OFF)	Min. 100 x 10 <sup>3</sup> operations	At contact rating, lamp load
Other	Vibration resistance	Misoperation	10 to 200Hz, acceleration 44m/s <sup>2</sup> (4.5G) constant acceleration		Direction X, Y, Z, contact ON/OFF total 6 cycles
		Endurance	10 to 200Hz, acceleration 44m/s <sup>2</sup> (4.5G) constant acceleration		Direction X, Y, Z, contact OFF total 6 hours
	Shock resistance	Misoperation	Min. 100m/s <sup>2</sup> (11 ± 1ms)		Direction X, Y, Z, contact ON/OFF total 36 times
		Endurance	Min. 1,000m/s <sup>2</sup> (6 ± 1ms)		Direction X, Y, Z, contact OFF total 18 times
	Dimensions / weight		12.1 x 15.5 x 13.7 mm / approx. 6g		

\*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. 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.

# FBR51, 52 Series

## ■ Coil Data (FBR51 series)

Coil code	Rated Coil Voltage	Coil Resistance +/-10%	Must Operate Voltage*	Must Release Voltage*
	(VDC)	(Ω)	(VDC)	(VDC)
D06	6	60	3.6 4.5 (at 85°C)	0.5 0.7 (at 85°C)
D09	6	135	5.4 6.8 (at 85°C)	0.7 0.9 (at 85°C)
D10	9	180	6.3 7.9 (at 85°C)	0.8 1.0 (at 85°C)
D12	12	240	7.3 9.2 (at 85°C)	1.0 1.3 (at 85°C)

## Coil Data (FBR52 series)

Coil code	Rated Coil Voltage	Coil Resistance +/-10%	Must Operate Voltage*	Must Release Voltage*
	(VDC)	(Ω)	(VDC)	(VDC)
D06	6	45	3.6 4.5 (at 85°C)	0.5 0.7 (at 85°C)
D09	6	100	5.4 6.8 (at 85°C)	0.7 0.9 (at 85°C)
D10	9	135	6.3 7.9 (at 85°C)	0.8 1.0 (at 85°C)
D12	12	180	7.3 9.2 (at 85°C)	1.0 1.3 (at 85°C)

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.

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

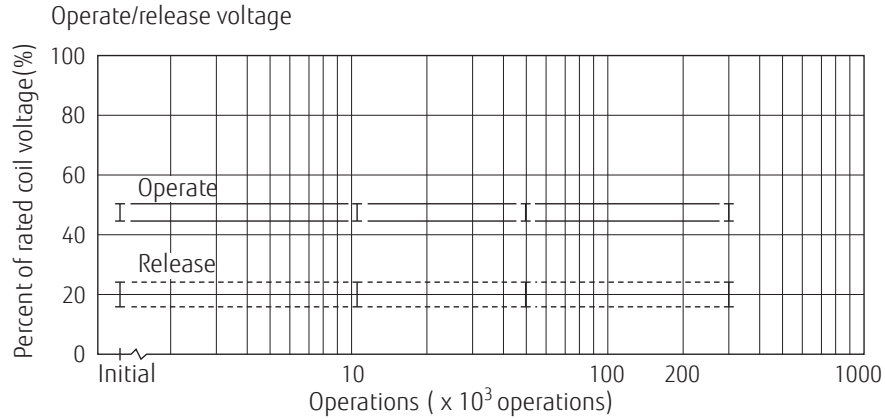
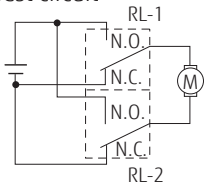
# FBR51, 52 Series

## ■ Characteristic Data (Reference)

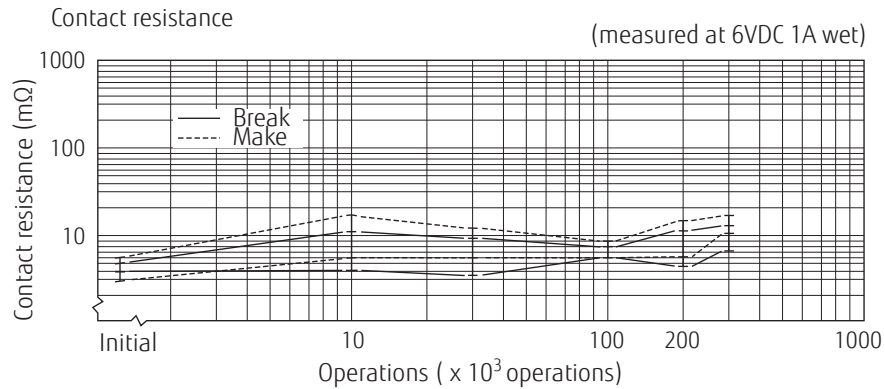
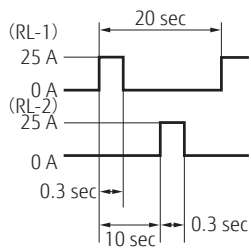
\* Characteristic data is not a guaranteed value, but measured values of samples from production line.

- Test item  
25A 14VDC  
motor lock 200,000  
operations minimum  
(FBR52N(-)-W1 type)

- Test circuit

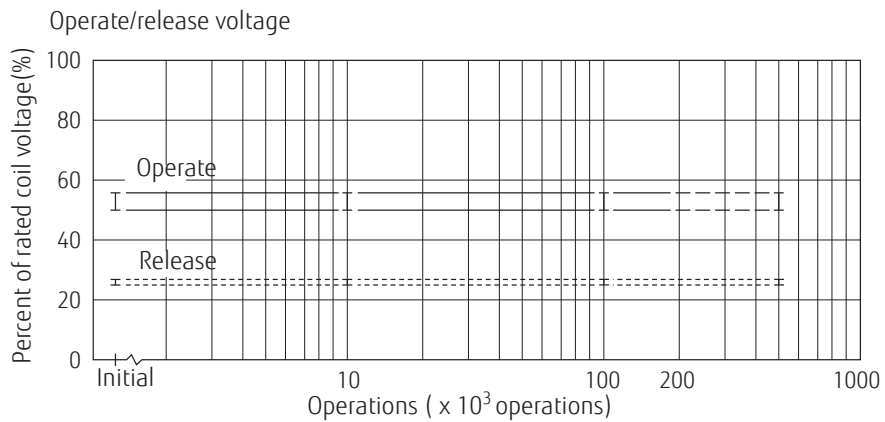
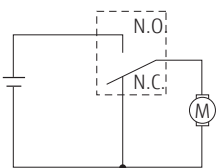


- Current wave form

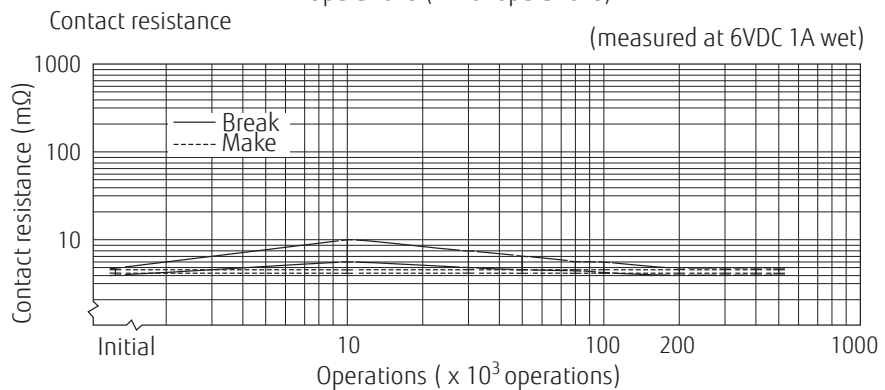
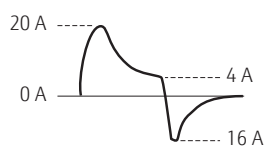


- Test item  
20A 14VDC  
motor free 400,000  
operations minimum  
(FBR51N(-)-W1 type)

- Test circuit



- Current wave form

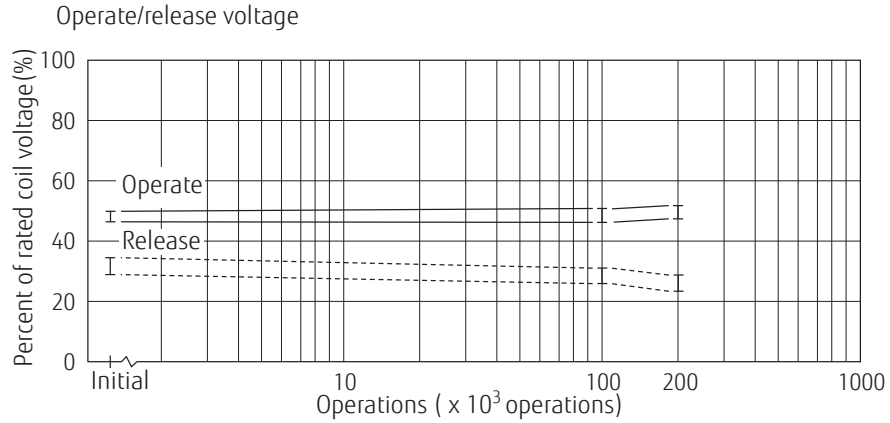
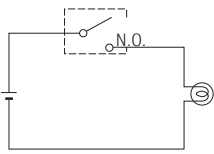


# FBR51, 52 Series

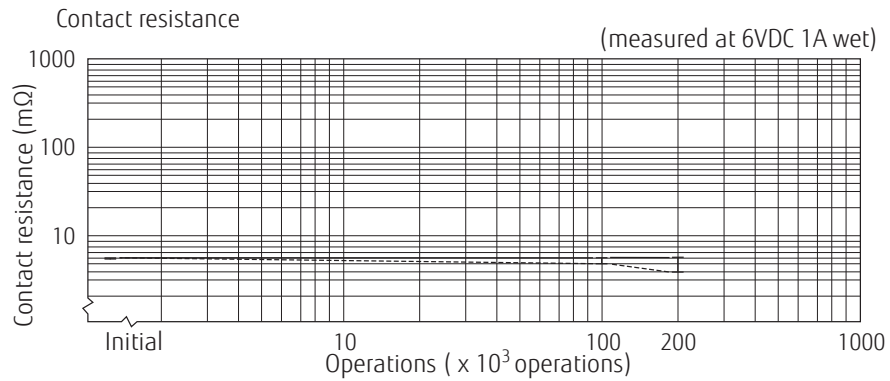
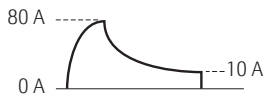
- Life test (example)

- Test item  
Inrush 80A 14VDC  
lamp load (120W)  
100,000 ops. minimum  
(FBR51N( )-WL type)

- Test circuit

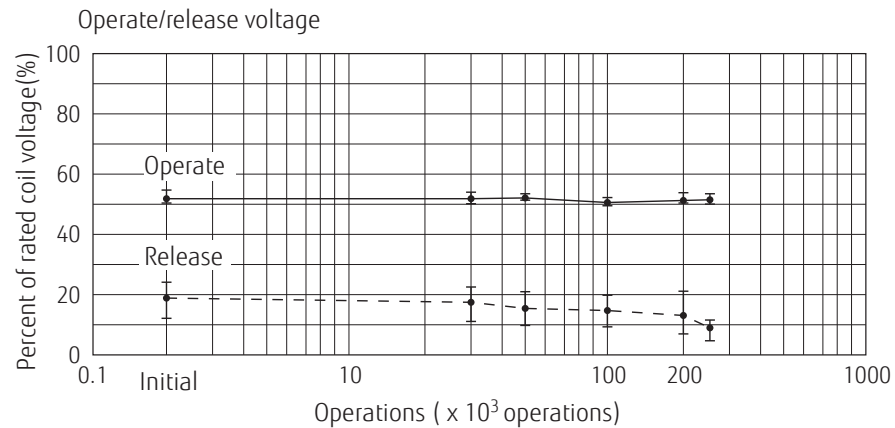
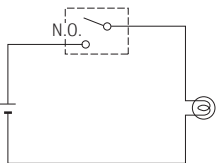


- Current wave form

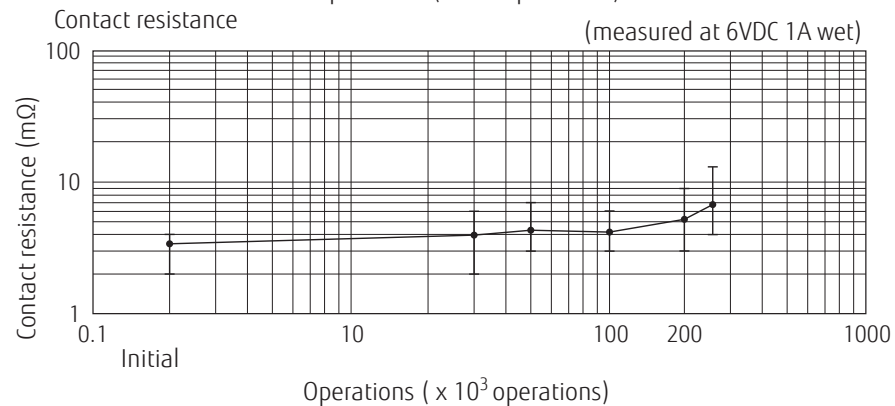


- Test item  
Inrush 11A 14VDC  
flasher, hazard lamp  
(80W)load 2,500,000  
operations minimum  
(FBR51N( )-WF type)

- Test circuit

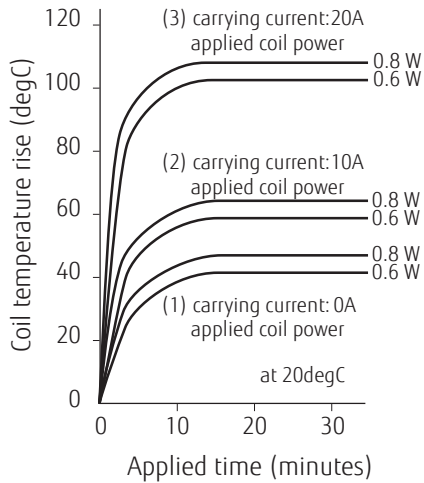


- Current wave form

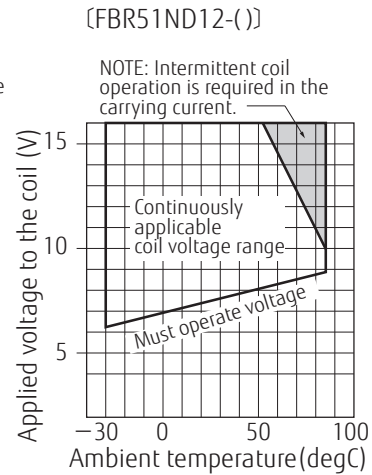
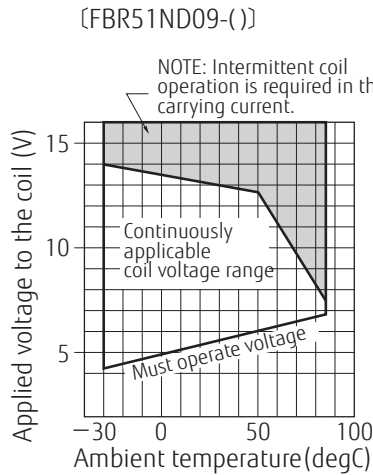


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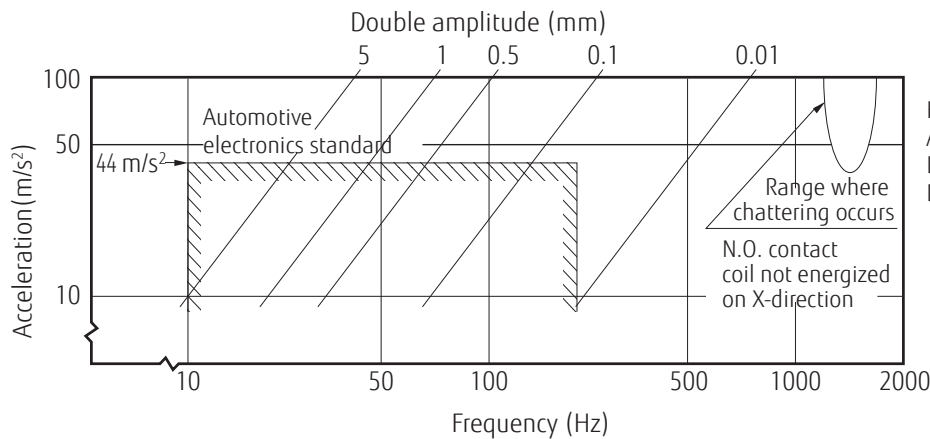
## Coil Temperature Rise



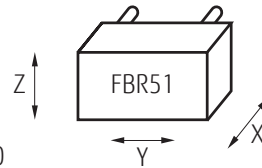
## Operating Coil Voltage Range



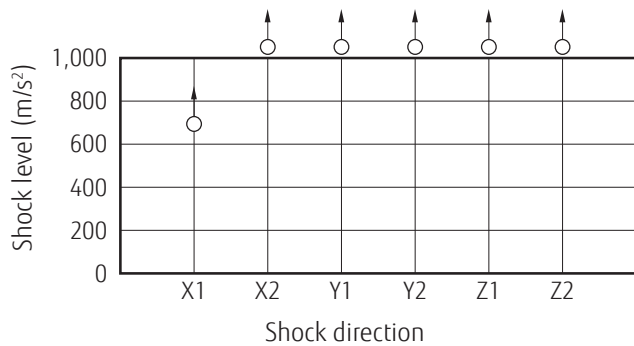
## Coil Temperature Rise



Frequency: 10 to 2000 Hz  
Acceleration: 100m/s<sup>2</sup> max.  
Direction of vibration: see under diagram  
Detection level: chatter > 1ms.

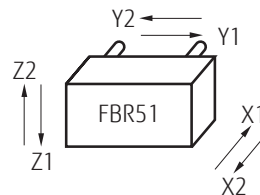


## Shock Resistance Characteristics



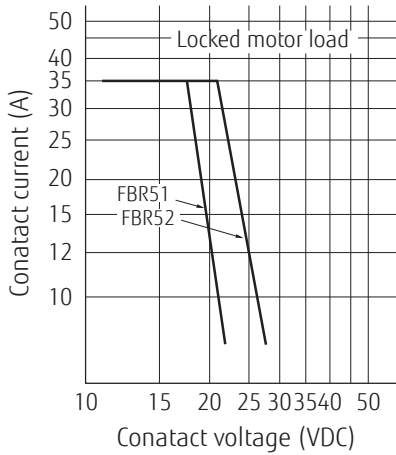
○ : N.C. contact (coil de-energized)  
N.O. contact: min. 1,000m/s<sup>2</sup> in all directions

Shock application time: 6<sup>+1</sup>ms, half-sine wave  
Test material: coil, energized and de-energized  
Shock direction: set under diagram  
Detection level: chatter > 1ms.

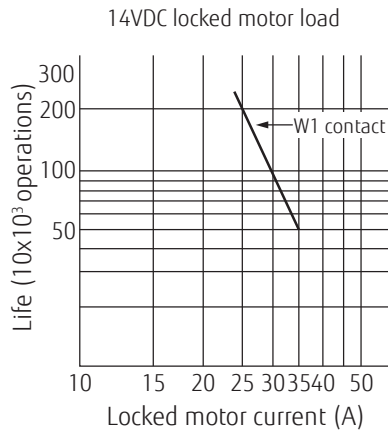


# FBR51, 52 Series

Maximum Switching Power

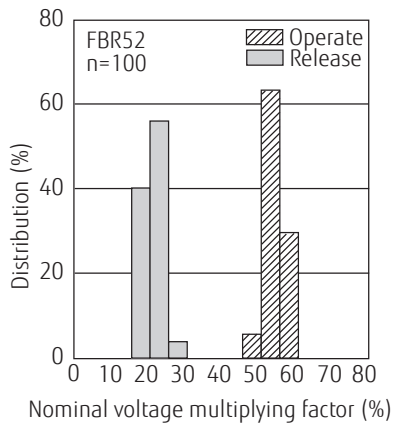


Live Curve

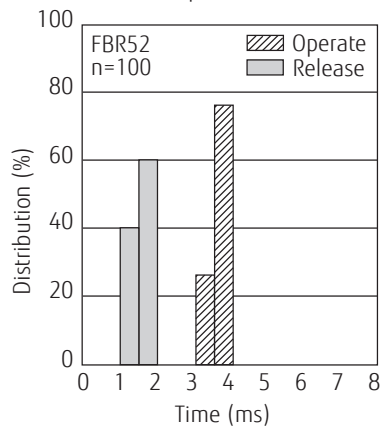


Initial Distributions data

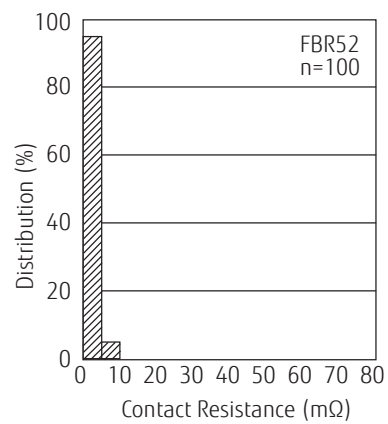
Distribution of operate and release voltage



Distribution of operate and release time



Distribution of contact resistance

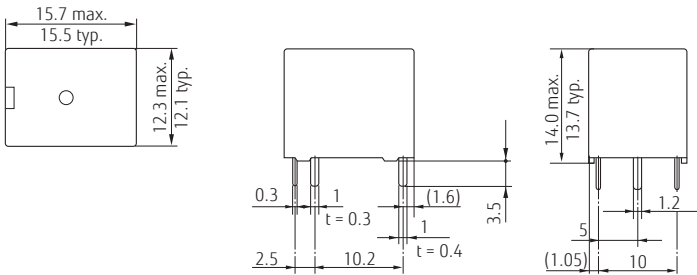




# FBR51, 52 Series

## ■ Dimensions

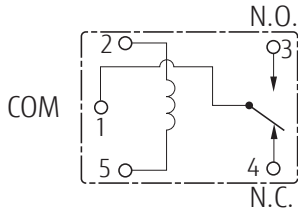
- Dimensions



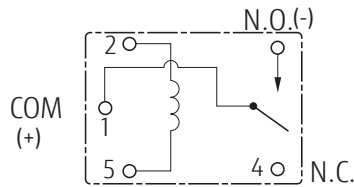
\* Dimensions of the terminals do not include thickness of pre-solder.

- Schematics  
(BOTTOM VIEW)

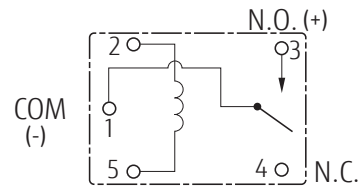
FBR50-W1



FBR50-WL

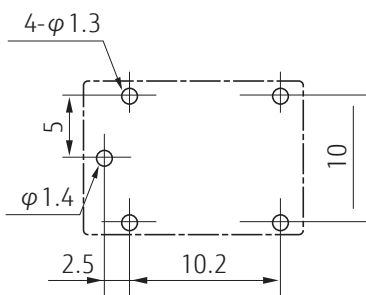


FBR50-WF



Refer to the test circuit at CHARACTERISTIC DATA for connection, and polarity.

- PC Board Mounting Hole Layout  
(BOTTOM VIEW)



( ): Reference value  
Unit: mm

\* Tolerance of PC board mounting hole layout :  $\pm 0.1$  unless otherwise specified.

# FBR51, 52 Series

## Cautions

- All values mentioned in this datasheet are provided under ideal conditions. Please perform the confirmation test before actual use.
- Please connect relay coils according to specified polarity.
- 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.

## GENERAL INFORMATION

### 1. ROHS Compliance

- All relays produced by Fujitsu Components are compliant with RoHS directive 2011/65/EU including amendments.
- Use of Cadmium in electrical contacts is exempted as per Annex III of the RoHS directive 2011/65/EU. Please consider expiry date of exemption. Relays with Cadmium containing contacts are not to be used for new designs.
- All relays are lead-free. Please refer to Lead-Free Status Info for older date codes at:  
<http://www.fujitsu.com/downloads/MICRO/fcai/relays/lead-free-letter.pdf>
- Characteristic data is not guaranteed values, but measured values of samples from production line.

### 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 350-360°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.

# FBR51, 52 Series

## Fujitsu Components International Headquarter Offices

### Japan

FUJITSU COMPONENT LIMITED  
Shinagawa Seaside Park Tower 19F,  
12-4, Higashi-shinagawa 4-chome, Shinagawa-ku,  
Tokyo, 140-0002, Japan  
Tel: (81-3) 3450-1682  
Fax: (81-3) 3474-2385  
Email: fcl-contact@cs.jp.fujitsu.com  
Web: www.fujitsu.com/jp/fcl/

### North and South America

FUJITSU COMPONENTS AMERICA, INC  
2290 North First Street, Suite 212  
San Jose, CA 95131, USA  
Tel: (1-408) 745-4900  
Fax: (1-408) 745-4970  
Email: components@us.fujitsu.com  
Web: us.fujitsu.com/components

### Europe

FUJITSU COMPONENTS EUROPE B.V.  
Diamantlaan 25  
2132 WV Hoofddorp  
Netherlands  
Tel: (31-23) 5560910  
Fax: (31-23) 5560950  
Email: info@fceu.fujitsu.com  
Web: www.fujitsu.com/uk/components

### Asia Pacific

FUJITSU COMPONENTS ASIA, LTD.  
102E Pasir Panjang Road  
#01-01 Citilink Warehouse Complex  
Singapore 118529  
Tel: (65) 6375-8560  
Fax: (65) 6273-3021  
Email: fcal@sg.fujitsu.com  
Web: www.fujitsu.com/sg/products/devices/components

### China

FUJITSU ELECTRONIC COMPONENTS (SHANGHAI) CO., LTD.  
Unit 4306, InterContinental Center  
100 Yu Tong Road, Shanghai 200070,  
China  
Tel: (86-21) 3253 0998  
Fax: (86-21) 3253 0997  
Email: fcal@sg.fujitsu.com  
Web: www.fujitsu.com/sg/products/devices/components

### Hong Kong

FUJITSU COMPONENTS HONG KONG CO., LTD  
Unit 506, Inter-Continental Plaza  
No.94 Granville Road, Tsim Sha Tsui, Kowloon,  
Hong Kong  
Tel: (852) 2881-8495  
Tex: (852) 2894-9512  
Email: fcal@sg.fujitsu.com  
Web: www.fujitsu.com/sg/products/devices/components/

### Korea

FUJITSU COMPONENTS KOREA LIMITED  
Alpha Tower #403, 645 Sampyeong-dong,  
Bundang-gu, Seongnam-si, Gyeonggi-do,  
13524 Korea  
Tel: (82) 31-708-7108  
Fax: (82) 31-709-7108  
Email: fcal@sg.fujitsu.com  
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