

# MINIATURE RELAY

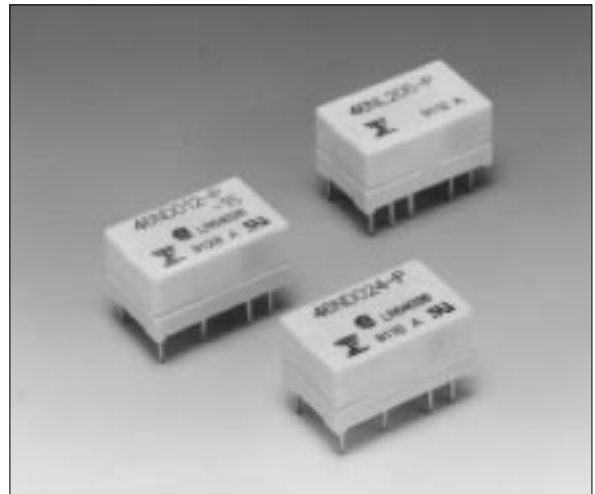
## 2 POLES—1 to 2 A (FOR SIGNAL SWITCHING)

### FBR46 SERIES

**RoHS Compliant**

#### ■ FEATURES

- Miniature size  
About 50% smaller in volume compared with the FBR240 series used mainly in communication equipment.
- High surge voltage  
2,500 V minimum of surge strength (Bellcore standard), and 1,500 VAC minimum of dielectric strength between coil and contact (-15, -16 type).
- Low power consumption  
85 mW of operate power (150 mW of nominal power consumption) by built-in permanent magnet.
- Shipping tube package
- RoHS compliant since date code: 0433A  
Please see page 7 for more information



#### ■ ORDERING INFORMATION

[Example]    FBR46    N    D    012    -P    -15    -CSA  
                   (a)    (b)    (\*)    (c)    (d)    (e)    (f)

(a)	Series Name	FBR46 : FBR46 Series
(b)	Enclosure	N : Plastic sealed
(*)	Coil Type	D : Standard, -15, -16 (DC coil) G : 65% Operate type L1 : Single winding latching type L2 : Double winding latching type (refer to the SPECIFICATIONS)
(c)	Nominal Voltage	(Example) Standard, -15, -16 type      (Example) Latching type 005: 5 VDC                                      05: 5 VDC 012: 12 VDC                                     12: 12 VDC (refer to the COIL DATA CHART)
(d)	Contact Material	-P : Gold-overlay silver-palladium
(e)	Dielectric Strength	Nil : Between coil and contacts 1,000 VAC, between contacts 750 VAC -15 : Between coil and contacts 1,500 VAC, between contacts 750 VAC -16 : Between coil and contacts 1,500 VAC, between contacts 1,000 VAC
(f)	Safety Specification	Nil : Standard (UL114 recognized) -CSA : UL114 + CSA recognized

Note: The designation name is stamped on the top of the relay case as follows:  
 (Example) Designation ordered: FBR46ND012-P  
 Stamp: 46ND012-P

# FBR46 SERIES

## ■ SAFETY STANDARD AND FILE NUMBERS

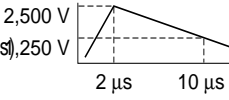
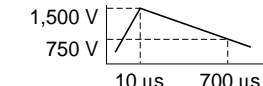
UL114 (File No. E63615)

C22.2 No. 14 (File No. LR40304 or LR64026)

Nominal voltage	Contact rating
1.5 to 24 VDC	1 A 30 VDC resistive 0.5 A 120 VAC resistive

\* Excluding latching type FBR46L

## ■ SPECIFICATIONS

Item		D type, G type	-15 type	-16 type	Latching	
Contact	Arrangement and Style	2 form C (DPDT), bifurcated				
	Material	Gold-overlay silver-palladium				
	Resistance (initial)	Maximum 100 mΩ (at 0.1 A 6 VDC)				
	Ratings (resistive)	0.5 A 120 VAC or 1 A 30 VDC				
	Maximum Carrying Current	1.25 A				
	Maximum Switching Power	60 AV or 30 W				
	Max. Switching Voltage* <sup>1</sup>	125 V				
	Maximum Switching Current	1 A				
	Minimum Switching load* <sup>2</sup>	0.01 mA 10 mVDC (reference)				
	Electrostatic Capacity (reference)	Approximately 2 pF (between coil and contacts) Approximately 1 pF (between open contacts)				
Coil	Nominal power (at 20°C)	0.15 to 0.2 W 0.25 W	0.2 to 0.25 W		0.2 W	
	Operate power (at 20°C)	0.085 to 0.112 0.106 W maximum	0.112 to 0.14 W maximum		0.128 W maximum	
	Operating Temperature	-30°C to +70°C (no frost) (refer to the CHARACTERISTIC DATA)				
	Operating Humidity	45 to 85%RH				
Time Value	Operate (at nominal voltage)	Maximum 5 ms				
	Release (at nominal voltage)	Maximum 2 ms				
Insulation	Resistance (initial)	Minimum 1000 MΩ (at 500 VDC)				
	Dielectric Strength (for 1 minute)	between coil and contacts between adjacent contacts	1,000 VAC	1,500 VAC		1,000 VAC
		between open contacts	750 VAC		1,000 VAC	750 VAC
		between set-reset-coil	—			250 VAC
Surge Strength	between coil and contacts between adjacent contacts	1,500 V (at 10 × 700 μs)	 2,500 V (at 2 × 10 μs), 250 V		1,500 V (at 10 × 700 μs)	
	between open contacts	1,500 V (at 10 × 700 μs)			 1,500 V 750 V	

Continued

# FBR46 SERIES

Item		D type, G type	-15 type	-16 type	Latching
Life	Mechanical	50 × 10 <sup>6</sup> operations minimum			
	Electrical (refer to the REFERENCE DATA)	DC	2 × 10 <sup>5</sup> operations minimum (at contact rating)		
		AC	1 × 10 <sup>5</sup> operations minimum (at contact rating)		
Other	Vibration Resistance		10 to 55 Hz (double amplitude of 1.5 mm)		
	Shock Resistance	Misoperation	500 m/s <sup>2</sup> (11 ± <sup>1</sup> ms)		
		Endurance	1,000 m/s <sup>2</sup> (11 ± <sup>1</sup> ms)		
	Weight		Approximately 2.5 g		

\*1 If the switching voltage exceeds the rated contact voltage, reduce the current. The current values vary according to the type of load.

\*2 Values when switching a resistive load at normal room temperature and humidity and in a clean environment. The minimum switching load varies with the switching frequency and operation environment.

## ■ COIL DATA CHART

### 1. STANDARD (D type)

MODEL	Nominal voltage	Coil resistance (±10%)	Nominal current (at nominal voltage) approx.	Must operate voltage*1	Must release voltage*1	Nominal power	Operate power	Coil temperature rise
FBR46ND003-P	3 VDC	60 Ω	50 mA	75% max. of nominal voltage	5% min. of nominal voltage	Approx. 150 mW (at nominal voltage)	Approx. 85 mW max.	Approx. 25 deg (at nominal voltage)
FBR46ND005-P	5 VDC	167 Ω	30 mA					
FBR46ND006-P	6 VDC	240 Ω	25 mA					
FBR46ND009-P	9 VDC	540 Ω	17 mA					
FBR46ND012-P	12 VDC	960 Ω	13 mA					
FBR46ND024-P	24 VDC	2,880 Ω	8 mA	200 mW	112 mW	30 deg		

\*1: Specified values are subject to pulse wave voltage.

Note: All values in the table are measured at 20°C

### 2. 65% OPERATE TYPE (G type)

MODEL	Nominal voltage	Coil resistance (±10%)	Nominal current (at nominal voltage) approx.	Must operate voltage*1	Must release voltage*1	Nominal power	Operate power	Coil temperature rise
FBR46NG003-P	3 VDC	36 Ω	83 mA	65% max. of nominal voltage	10% min. of nominal voltage	Approx. 250 mW (at nominal voltage)	Approx. 106 mW max.	Approx. 35 deg (at nominal voltage)
FBR46NG005-P	4.5 VDC	81 Ω	56 mA					
FBR46NG006-P	6 VDC	144 Ω	41 mA					
FBR46NG009-P	9 VDC	324 Ω	27 mA					
FBR46NG012-P	12 VDC	576 Ω	20 mA					
FBR46NG024-P	24 VDC	2,304 Ω	10 mA					

\*1: Specified values are subject to pulse wave voltage.

Note: All values in the table are measured at 20°C

# FBR46 SERIES

## 3. HIGH DIELECTRIC STRENGTH TYPE (-15, -16 type)

MODEL		Nominal voltage	Coil resistance ( $\pm 10\%$ )	Nominal current (at nominal voltage) approx.	Must operate voltage*1	Must release voltage*1	Nominal power	Operate power	Coil temperature rise
-15 type	-16 type								
FBR46ND003-P-15	FBR46ND003-P-16	3 VDC	45 $\Omega$	67 mA	75% max. of nominal voltage	5% min. of nominal voltage	Approx. 200 mW (at nominal voltage)	Approx. 112 mW max.	Approx. 30 deg (at nominal voltage)
FBR46ND005-P-15	FBR46ND005-P-16	5 VDC	125 $\Omega$	40 mA					
FBR46ND006-P-15	FBR46ND006-P-16	6 VDC	180 $\Omega$	33 mA					
FBR46ND009-P-15	FBR46ND009-P-16	9 VDC	405 $\Omega$	22 mA					
FBR46ND012-P-15	FBR46ND012-P-16	12 VDC	720 $\Omega$	17 mA					
FBR46ND024-P-15	FBR46ND024-P-16	24 VDC	2,304 $\Omega$	10 mA			250 mW	140 mW	35 deg

\*1: Specified values are subject to pulse wave voltage.

Note: All values in the table are measured at 20°C.

## 4. LATCHING TYPE (L1, L2 type)

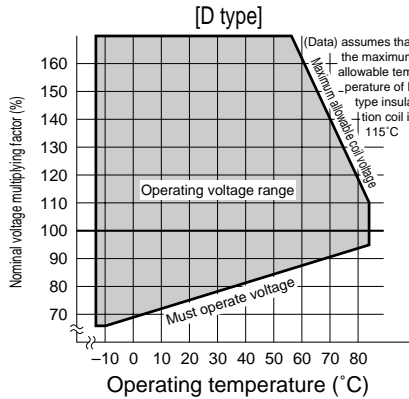
MODEL		Nominal voltage	Coil resistance ( $\pm 10\%$ )	Nominal current (at nominal voltage) approx.	Must operate voltage*1	Must release voltage*1	Nominal power	Operate power
Single winding latching type	Double winding latching type							
FBR46NL103-P	FBR46NL203-P	3 VDC	45 $\Omega$	67 mA	80% max. of nominal voltage	80% max. of nominal voltage	Approx. 200 mW (at nominal voltage)	Approx. 128 mW max.
FBR46NL105-P	FBR46NL205-P	5 VDC	125 $\Omega$	40 mA				
FBR46NL106-P	FBR46NL206-P	6 VDC	180 $\Omega$	33 mA				
FBR46NL109-P	FBR46NL209-P	9 VDC	405 $\Omega$	22 mA				
FBR46NL112-P	FBR46NL212-P	12 VDC	720 $\Omega$	17 mA				

\*1: Specified values are subject to pulse wave voltage.

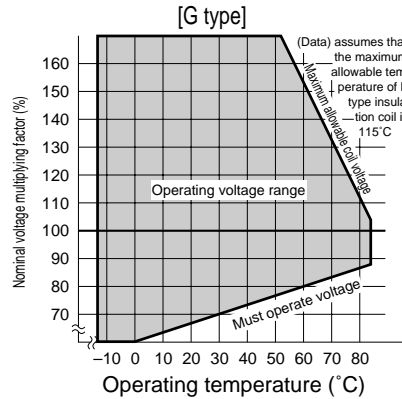
Note: All values in the table are measured at 20°C.

## CHARACTERISTIC DATA

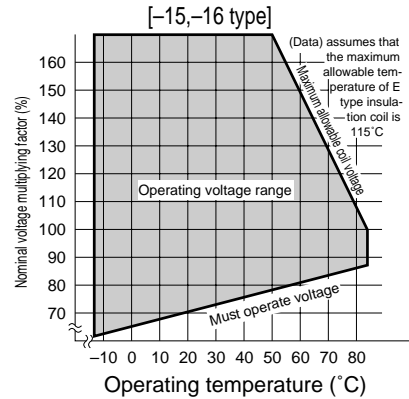
Range of operation temperature and voltage



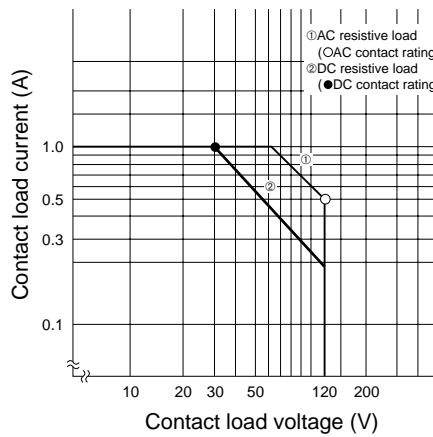
Range of operation temperature and voltage



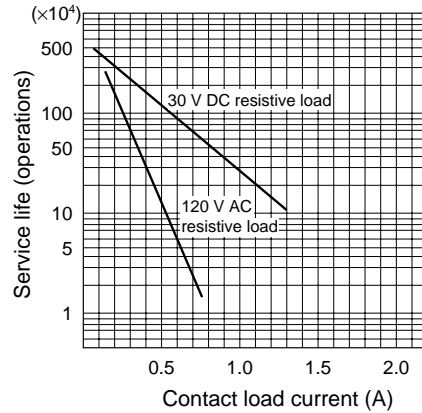
Range of operation temperature and voltage



Maximum switching capacity

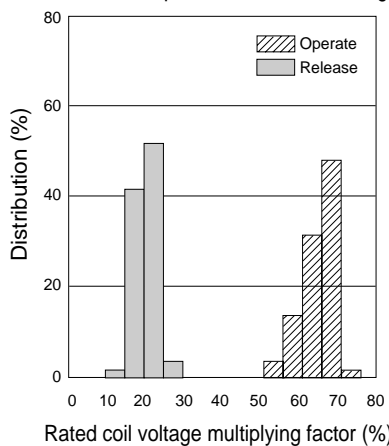


Life curve

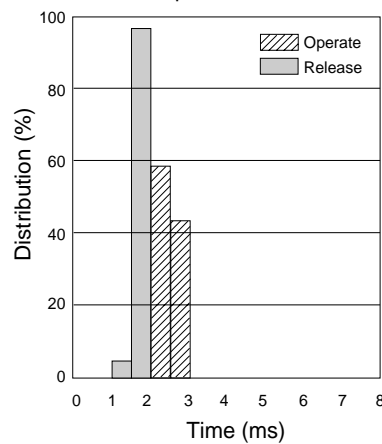


## REFERENCE DATA

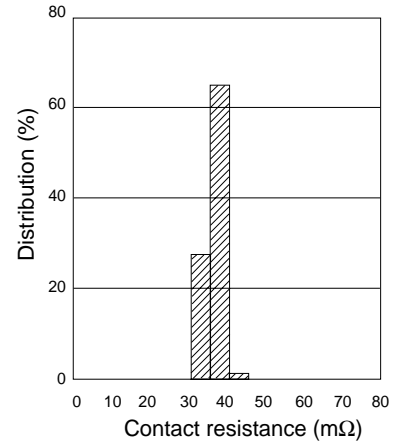
Distribution of operate and release voltage



Distribution of operate and release time



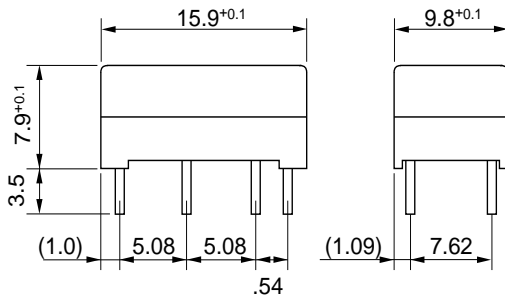
Distribution of contact resistance



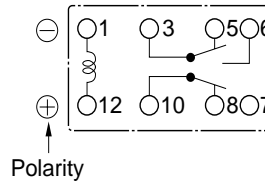
# FBR46 SERIES

## ■ DIMENSIONS

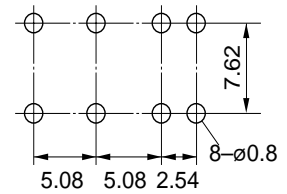
### ●Dimensions



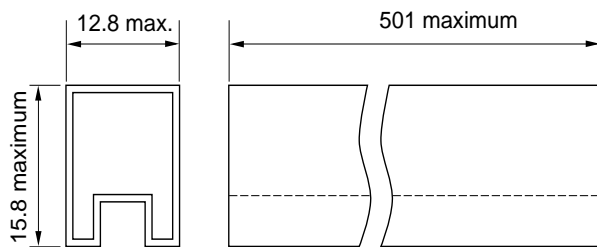
### ●Schematics (BOTTOM VIEW)



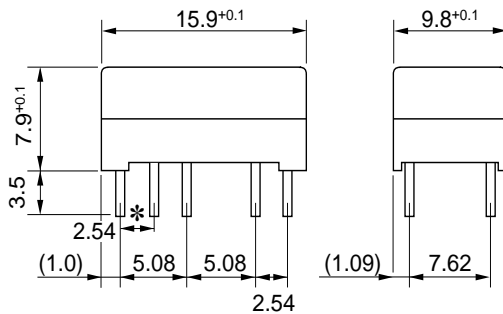
### ●PC board mounting hole layout (BOTTOM VIEW)



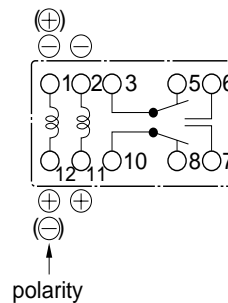
### ●Tube carrier



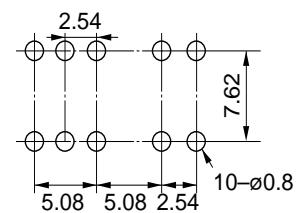
### ●Dimensions (Latching type)



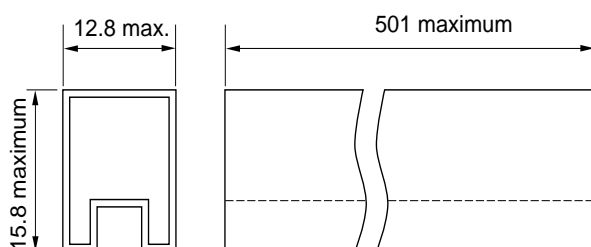
### ●Schematics (BOTTOM VIEW)



### ●PC board mounting hole layout (BOTTOM VIEW)



### ●Tube carrier



Note: ·No 2, 11 terminals are for double winding latching type only.  
 ·(⊕) (⊖) are reset polarity for single winding latching type.  
 ·The terminal number is not shown on the relay.

Unit: mm

## RoHS Compliance and Lead Free Relay Information

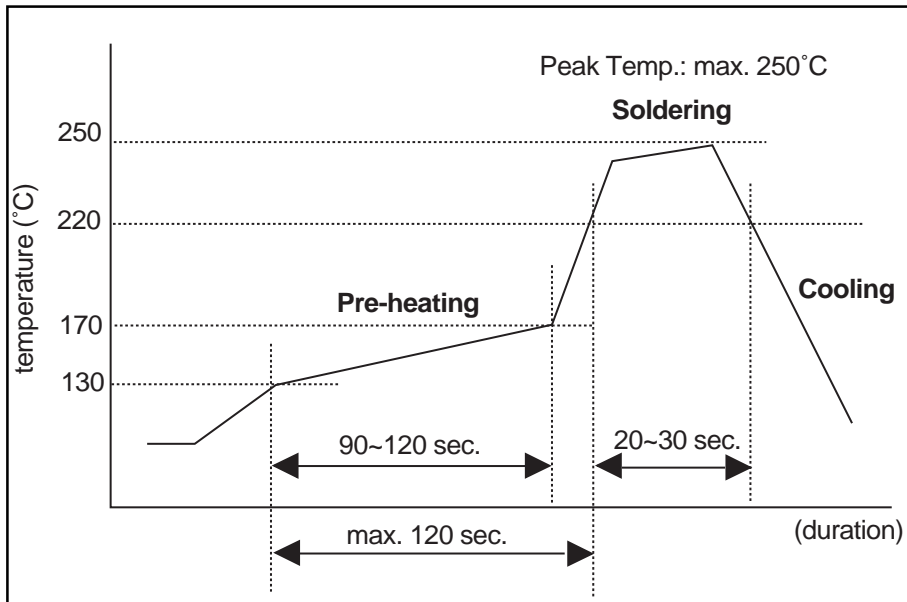
### 1. General Information

- Relays produced after the specific date code that is indicated on each data sheet are lead-free now. Most of our signal and power relays are lead-free. Please refer to Lead-Free Status Info. (<http://www.fcai.fujitsu.com/pdf/LeadFreeLetter.pdf>)
- Lead free solder paste currently used in relays is Sn-3.0Ag-0.5Cu. From February 2005 forward Sn-3.0Cu-Ni will be used for FTRB3 and FTR-B4 series relays.
- Most signal and some power relays also comply with RoHS. Please refer to individual data sheets. Relays that are RoHS compliant do not contain the 6 hazardous materials that are restricted by RoHS directive (lead, mercury, cadmium, chromium IV, PBB, PBDE).
- It has been verified that using lead-free relays in leaded assembly process will not cause any problems (compatible).
- "LF" is marked on each outer and inner carton. (No marking on individual relays).
- To avoid leaded relays (for lead-free sample, etc.) please consult with area sales office. We will ship leaded relays as long as the leaded relay inventory exists.

### 2. Recommended Lead Free Solder Profile

- Recommended solder paste Sn-3.0Ag-0.5Cu and Sn-3.0 Cu-Ni (only FTR-B3 and FTR-B4 from February 2005)

#### Reflow Solder condition



#### Flow Solder condition:

Pre-heating: maximum 120°C  
Soldering: dip within 5 sec. at 260°C solder bath

#### Solder by Soldering Iron:

Soldering Iron  
Temperature: maximum 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.

### 4. Tin Whisker

- SnAgCu solder is known as low risk of tin whisker. No considerable length whisker was found by our in-house test.

### 5. Solid State Relays

- Each lead terminal will be changed from solder plating to Sn plating and Nickel plating. A layer of Nickel plating is between the terminal and the Sn plating to avoid whisker.

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