
TELEDYNE SOLID STATE
MILITARY SOLID STATE RELAY
T-25-31

**LOW LEAKAGE
HIGH VOLTAGE
BI-DIRECTIONAL AND DC OUTPUT**

SERIES
FB00CD
FB00FC
FB00KB
SPST/NO
FEATURES

- High voltage output
- Extremely low leakage current (200 nanoamperes)
- Bi-directional Power FET output
- Optical isolation
- Fast switching speed
- Adjustable turn-on times
- Low profile 6 pin mini-DIP
- Built and tested to MIL-R-28750 utilizing the test methods of MIL-STD-883
- Available to the 'W' and 'Y' screening levels of MIL-R-28750

APPLICATIONS

- Ideal for Automatic Test Equipment (ATE)
- Telecommunications applications
- High voltage instrumentation systems
- High speed switching with low EMI

DESCRIPTION

The FB series relay is an advanced solid state bi-directional relay designed specifically for high speed switching in A.T.E. systems. These devices utilize Teledyne state-of-the-art solid state circuit technology and manufacturing techniques to provide high reliability, low life cycle cost and exceptional switch performance. Each device is uniquely characterized by its switching function.

The FB00FC is a power instrumentation switch with low ON resistance and leakage current. The FB00KB is a high voltage instrumentation switch with a quarter ampere current rating. The FB00CD is a power switch with a current rating of 1 ampere and an ON resistance of 0.4 ohm.

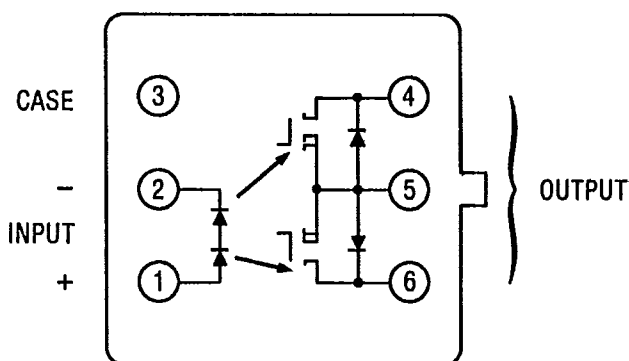
The FB series solid state relay has very fast turn on times of under 1 msec and can also be controlled and adjusted with the input current for specific requirements.

Other features include optical coupling and full military temperature operating range for extreme applications. Optical coupling minimizes EMI generation and isolates and protects delicate input logic circuits from output voltage transients.

These devices are packaged and hermetically sealed in a low profile metal 6 pin mini-DIP with lead spacing on 0.300 centers for standard mounting configurations.

PART NUMBER*	DESC DRAWING NUMBER	RELAY DESCRIPTION
FB00CDW	89116-005	Basic Solid State Relay $\pm 1.0 \text{ A @ } \pm 80 \text{ Vdc Output}$
FB00CDY	89116-006	
FB00FCW	89116-001	Basic Solid State Relay $\pm 0.5 \text{ A @ } \pm 180 \text{ Vdc Output}$
FB00FCY	89116-002	
FB00KBW	89116-003	Basic Solid State Relay $\pm 250 \text{ mA @ } \pm 350 \text{ Vdc Output}$
FB00KBY	89116-004	

* The W or Y suffix denotes the screening level of MIL-R-28750.

BLOCK DIAGRAM (BOTTOM VIEW)


T-25-31

ELECTRICAL SPECIFICATIONS

(-55°C TO 120°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED)

INPUT (CONTROL) CHARACTERISTICS (See Note 1)	MIN.	TYP.	MAX.	UNITS
Rated Input Current		25		mAdc
Input Voltage Drop at 25 mA			3.25	Vdc
Continuous	-55°C < T _A < 105°C	10	50	mAdc
Input Current	105°C < T _A < 120°C	10	25	
Reverse Voltage Protection			-5	Vdc
Input Current (Guaranteed Off)			10	μAdc
Input Current (Guaranteed On)	10			mA
Turn-Off Voltage			1.5	Vdc

ENVIRONMENTAL SPECIFICATIONS

Temperature Range	Operating	-55°C to +120°C
	Storage	-55°C to +125°C
Vibration		100 g, 10 to 3000 Hz
Constant Acceleration		5000 g
Shock		1500 g, 0.5 ms pulse

OUTPUT (LOAD) SPECIFICATIONS

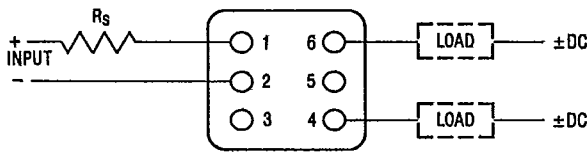
Bi-Directional and AC Configurations (Pin 4 to Pin 6) (See Note 2)

	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	UNITS
Continuous Load Current (See Fig. 3)		±1.0		±0.5		±0.25	Adc
Leakage Current @ V _{load} = max. operating voltage	-55°C < T _A < 25°C	±200		±200		±200	nAdc
	25°C < T _A < 120°C	±20		±20		±20	μAdc
Output Voltage Drop		±0.75		±1.0		±2.4	Vdc
Continuous Operating Load Voltage		±80		±180		±350	Vdc
Transient Blocking Voltage (5 s max.)		±90		±180		±360	Vdc
ON Resistance R _{ds} (on) at T _J = 25°C I _{load} = 100 mAdc (See Fig. 4)		0.4		1.0		7.2	Ohms
Turn-On Time @ I _N = 25 mA (See Fig. 2 and 5)		800		800		500	μs
Turn-Off Time (See Fig. 5)		500		500		500	μs
dv/dt	100		100		100		V/μs
Load Surge Current (See Note 3)		±3.5		±1.75		±0.875	Adc
DC Offset Voltage		100		100		100	μV
Output Capacitance at 25 Vdc, 1 MHz		325		250		100	pF

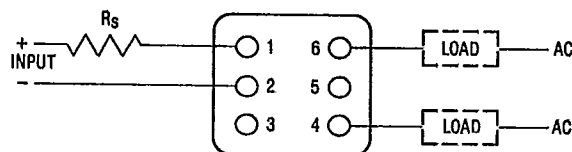
OUTPUT (LOAD) SPECIFICATIONS

DC Configuration (Pins 4 and 6 connected together to Pin 5) (See Note 2)

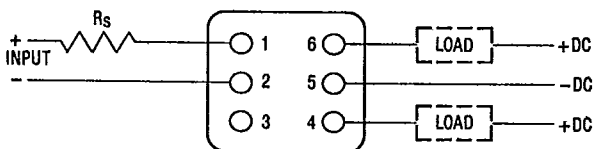
	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	UNITS
Continuous Load Current (See Fig. 3)		2.0		1.0		0.5	Adc
Leakage Current @ V _{load} = max. operating voltage	-55°C < T _A < 25°C	400		400		400	nAdc
	25°C < T _A < 120°C	40		40		40	μAdc
Output Voltage Drop		0.4		0.5		1.8	Vdc
Continuous Operating Load Voltage		80		180		350	Vdc
Transient Blocking Voltage (5 s max.)		90		180		360	Vdc
ON Resistance R _{ds} (on) at T _J = 25°C I _{load} = 100 mAdc (See Fig. 4)		0.1		0.25		1.8	Ohms
Turn-On Time @ I _N = 25 mA (See Fig. 2 and 5)		800		800		500	μs
Turn-Off Time (See Fig. 5)		500		500		500	μs
dv/dt	100		100		100		V/μs
Load Surge Current (See Note 3)		7.0		3.5		1.75	Adc
Output Capacitance at 25 Vdc, 1 MHz		650		500		200	pF
	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	UNITS
Input to Output Capacitance		5		5		5	pF
Dielectric Strength	500		500		500		Vac
Insulation Resistance @ 500 Vdc	10 ⁹		10 ⁹		10 ⁹		Ohms
Output Junction Temperature @ I _{load} = max. rated current		125		125		125	°C
Maximum Junction Temperature T _J (max.)		150		150		150	°C
Thermal Resistance Junction to Ambient θ _{JA}		110		110		110	°C/W
Thermal Resistance Junction to Case θ _{JC}		20		20		20	°C/W



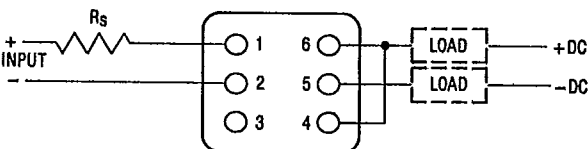
A) BI-DIRECTIONAL CONFIGURATION (SEE NOTE 4)



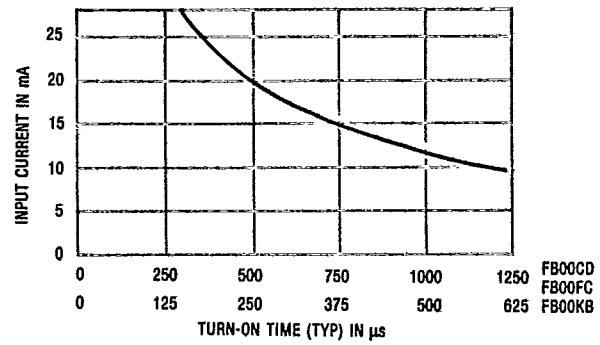
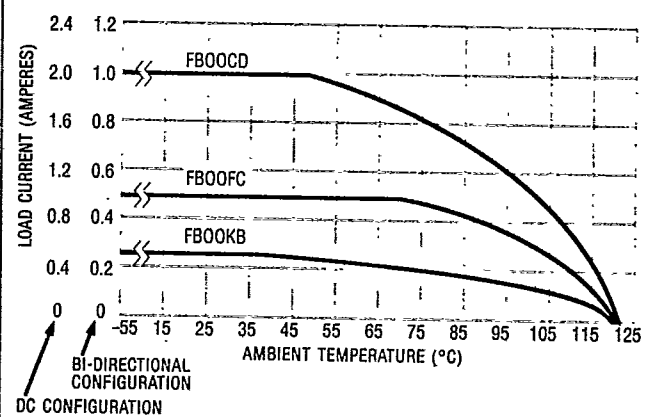
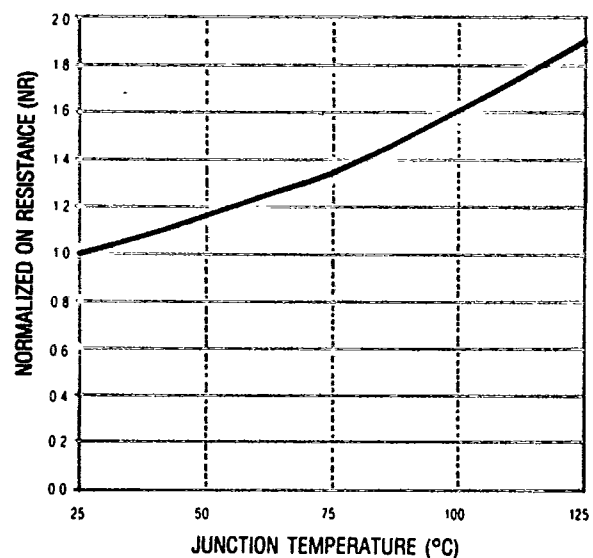
B) AC CONFIGURATION (SEE NOTE 4)



C) DPST DC CONFIGURATION (SEE NOTE 5)

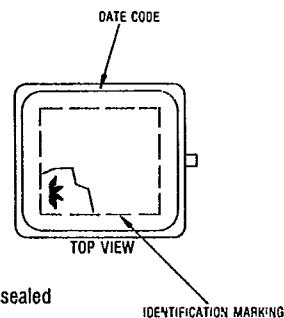
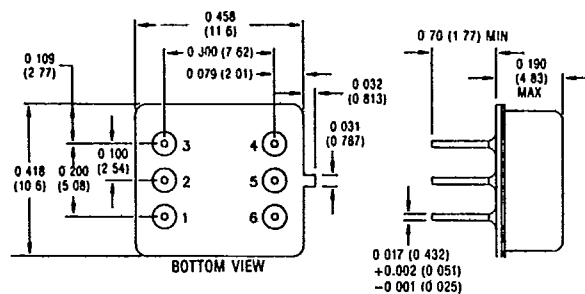


D) DC CONFIGURATION (SEE NOTE 4)

WIRING CONFIGURATIONS
FIGURE 1INPUT CURRENT VS TURN-ON TIME
FIGURE 2THERMAL DERATING CURVE
FIGURE 3NORMALIZED ON RESISTANCE VS JUNCTION TEMPERATURE
FIGURE 4 (See Note 7)

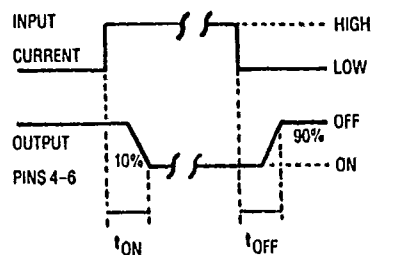
T-25-31

MECHANICAL SPECIFICATIONS



- **WEIGHT:** 2 gm max
- **CASE:** 6 pin DIP hermetically sealed
- **MATERIAL AND PLATING:**
CAN: Grade A Nickel
PINS AND HEADER: Kovar gold plated per MIL-G-45204.
Type III, Grade A, Class 1.

DIMENSIONS ARE SHOWN IN INCHES (MILLIMETERS)



OUTPUT TURN-ON AND TURN-OFF TIMING
FIGURE 5

NOTES:

1. Series resistor required to limit input current to 50 mA max.
2. The rated input current is 25 mA for all tests unless otherwise specified.
3. Surge current is specified for 25°C, 10 cycles maximum at a 1 Hz repetition rate with 10% duty cycle and 0.1 s. duration.
4. Relays may drive loads connected to either positive or negative referenced power supply lines. Inductive loads must be diode suppressed.
5. ON resistance of each pole is 1/2 of the ON resistance in the bi-directional configuration. Low side switching only can be accommodated in this configuration. Use the output (load) specifications for bi-directional and AC configurations.
6. Continuous load current is rated under the condition of still air.
7. To calculate the maximum ON resistance for a given junction temperature, find the normalized ON resistance factor (NR) from Figure 4. Calculate the new ON resistance as follows:

$$R_{(ON)} = NR \times R_{(ON)} @ 25^{\circ}C$$