Bi-Directional Solid State Relay

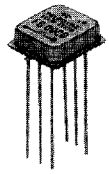
Series FB

TELEDYNE RELAYS

LOW LEAKAGE, HIGH VOLTAGE BI-DIRECTIONAL AND DC OUTPUT

Part Number*	DESC Drawing Number	Relay Description
FB00CDW FB00CDY	89116-006	Solid State Relay ±1.0 A @ ±80 Vdc Output
FB00FCW FB00FCY	89116-002	Solid State Relay ±0.5 A @ ±180 Vdc Output
FB00KBW FB00KBY	89116-004	Solid State Relay ±250 mA @ ±350 Vdc Output

* The Y suffix denotes parameters tested to MIL-R-28750 specifications. The W suffix denotes parameters tested to Teledyne specifications.



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 the requirements of MIL-R-28750

APPLICATIONS

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

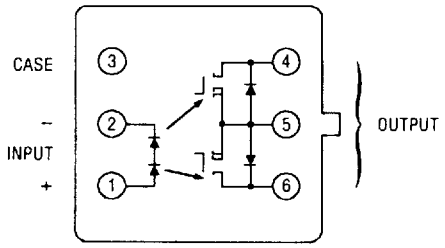
DESCRIPTION

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.

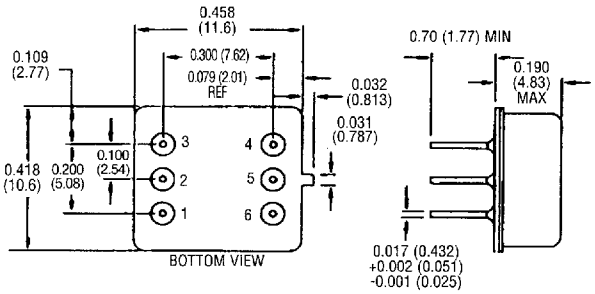
The FB00FC is a power instrumentation switch with low ON resistance and leakage current. The FB00KB is a high voltage instrumentation switch with a quarter ampere current rating. The FB00CD is a power switch with a current rating of 1 ampere and an ON resistance of 0.4 ohm. The FB series solid state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

BLOCK DIAGRAM

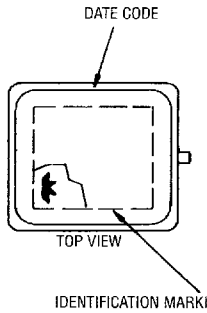


MECHANICAL SPECIFICATIONS



TOLERANCE:
.XXX = ± .005
.XX = ± .01
Unless otherwise specified

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



DIMENSIONS ARE SHOWN IN INCHES (MILLIMETERS)

12/96

ELECTRICAL SPECIFICATIONS

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

INPUT (CONTROL) SPECIFICATION

(See Note 1)		Min	Typ	Max	Units
Rated Input Current				25	mAdc
Input Voltage Drop at 25 mA				3.25	Vdc
Continuous Input Current	-55°C < T_A < 105°C	10		50	mAdc
	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 2000 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)

		FB00CD		FB00FC		FB00KB		
		Min	Max	Min	Max	Min	Max	Units
Continuous Load Current (See Fig. 3 & Note 5)			±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 & Note 6)			0.6		1.0		8.0	Ohms
Turn-On Time @ I_{IN} = 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

SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE

8917669 0000896 859

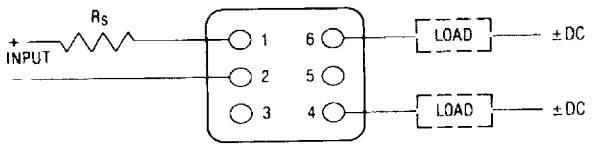
OUTPUT (LOAD) SPECIFICATIONS

DC Configuration (Pins 4 and 6 connected together referenced to Pin 5) (See Notes 2 & 7)

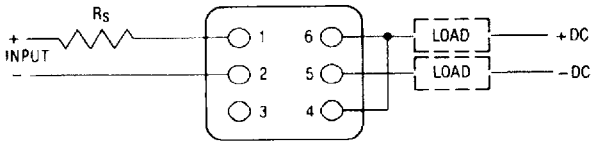
		FB00CD		FB00FC		FB00KB		
		Min	Max	Min	Max	Min	Max	Units
Continuous Load Current (See Fig. 3 & Note 5)			2.0		1.0		0.5	Adc
Leakage Current @ V_{LOAD} = max. operating voltage	-55°C < T_A < 25°C		400		400		400	nAdc
	-25°C < T_A < 120°C		40		40		40	µAdc
Output Voltage Drop			0.4		0.5		1.8	Vdc
Continuous 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 & Note 6)			0.15		0.25		2.0	Ohms
Turn-On Time @ I_{IN} = 25 mA (See Fig. 2 and 5)			800		800		500	µs
Turn-Off Time (See Fig. 5)			500		500		500	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

OUTPUT (LOAD) SPECIFICATIONS

All Configurations	FB00CD		FB00FC		FB00KB		
	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} = $I_{MAX\ RATED}$		125		125		125	°C
Maximum Junction Temperature (T_JMax.)		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

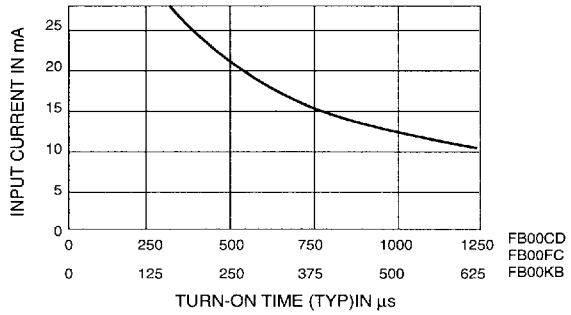


A) BI-DIRECTIONAL AND AC CONFIGURATION (SEE NOTE 4)

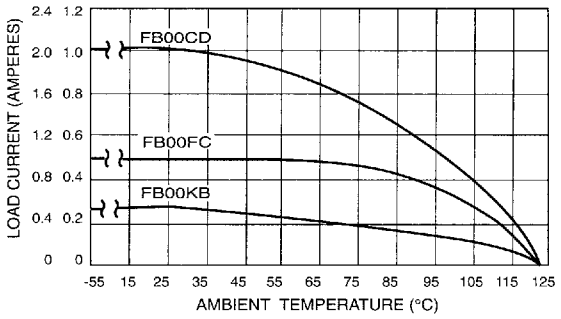


B) DC CONFIGURATION (SEE NOTE 4)

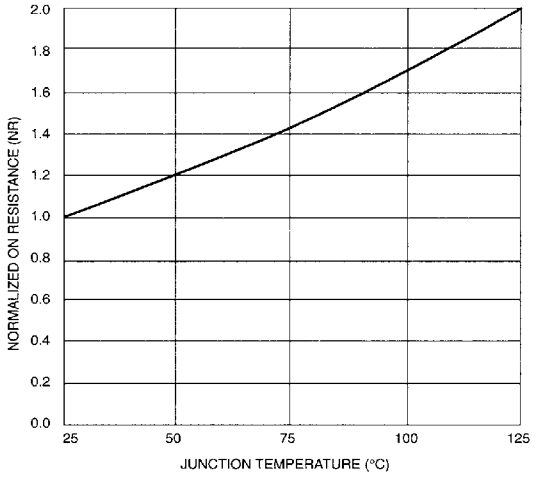
WIRING CONFIGURATIONS
FIGURE 1



INPUT CURRENT VS TURN-ON TIME
FIGURE 2



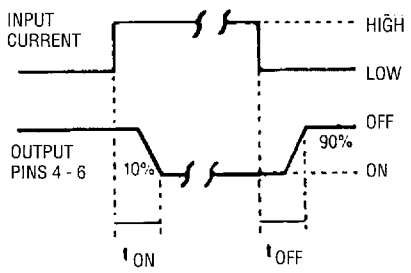
LOAD CURRENT DERATING CURVE
FIGURE 3



NORMALIZED ON RESISTANCE VS JUNCTION TEMPERATURE
FIGURE 4 (See Note 6)

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. Continuous load current is rated under the condition of still air.
6. 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 X R(ON) @ 25°C
7. Relays are tested in the bi-directional configuration only. D.C. parameters are shown for reference only.



OUTPUT TURN-ON AND OFF TIMING
FIGURE 5