

HIGH-VOLTAGE SOLID-STATE RELAY

LH1061AB

T-4/-83

Description

The LH1061AB High-Voltage Solid-State Relay is a double-pole, single-throw, normally-open switch (2 Form A), which can replace mechanical relays in many applications. The relay features logic-level input control of isolated high-voltage switch outputs. The outputs are rated at 200 V per pole and can handle loads up to 200 mA. Although the relay can switch both ac and dc loads, it is intended primarily for audio frequency or dc applications. Typical ON-Resistance is 12 Ω at 50 mA.

The LH1061AB Relay consists of a GaAlAs LED that optically couples control signals to a monolithic integrated circuit. Optical coupling provides 1500 Vrms of input/output isolation and the device is UL approved. The integrated circuit is a dielectrically isolated, high-voltage die comprised of photodiode arrays, switch control circuitry, and high-voltage DMOS transistor switches.

In operation, the device is exceptionally linear up to 100 mA. Beyond 100 mA, the incremental resistance decreases, thereby minimizing internal power dissipation. Overload currents are clamped at 250 mA by internal current limiting. An extended clamp condition, which increases relay temperature, results in a reduction in clamp current, thereby further reducing internal power dissipation and preserving the relay's integrity. The relay is packaged in an 8-pin plastic DIP.

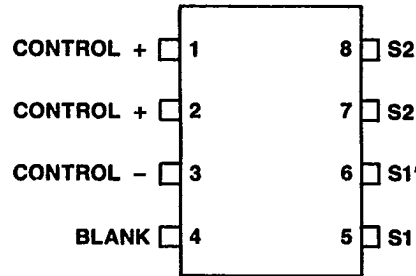
Features

- Low ON-Resistance
- Clean, bounce-free switching
- 1500 V Input/output isolation
- dv/dt typically better than 500 V/μs
- High-surge capability
- Low power consumption
- Noise-free operation
- No electromagnetic interference
- Monolithic IC reliability

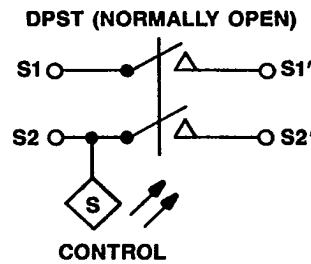
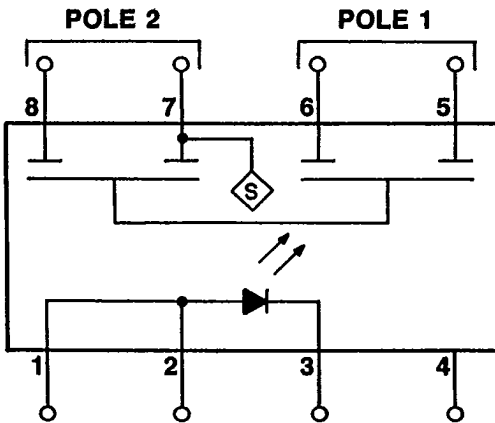
Applications

- Telephone switchhook
- High-voltage testers
- Industrial controls
- Isolation switching

Pin Diagram



Functional Diagram



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Maximum Ratings

At 25 °C

Stresses exceeding the values listed under Maximum Ratings may cause permanent damage to the device. This is an absolute stress rating only. Functional operation of the device at these or any other conditions in excess of those indicated in the operational sections of this data sheet is not implied. Exposure to maximum-rating conditions for extended periods of time may adversely affect device reliability.

Rating	Value	Unit
Ambient Operating Temperature Range	- 40 to + 85	°C
Storage Temperature Range	- 40 to + 100	°C
Pin Soldering Temperature (t = 15 seconds max)	300	°C
Input/Output Voltage Isolation	1500	Vrms
LED Input Ratings:		
Continuous Forward Current	20	mA
Reverse Voltage	10	V
Output Operation:		
Operating Voltage	200	V
dc or Peak Load Current (each pole, two poles operating simultaneously)	200	mA

Pin Descriptions

Pin	Symbol	Name/Function
1 2 3	Control + Control + Control -	These pins are the positive and negative inputs respectively to the input control LED. An appropriate amount of current through the LED will close the circuit path between S and S' (S Prime).
5, 6 7, 8	S1, S1' S2, S2'	These pins are the outputs. The pin designated as S represents one side of a relay pole. The pin designated as S' is the complementary side of a relay pole. S2 is electrically connected to the device substrate. To achieve maximum dv/dt sensitivity, connect S2 to the lowest circuit potential.
4	Blank	This pin may be used as a tie-point for external components. Voltage on this pin should not exceed 300 V.

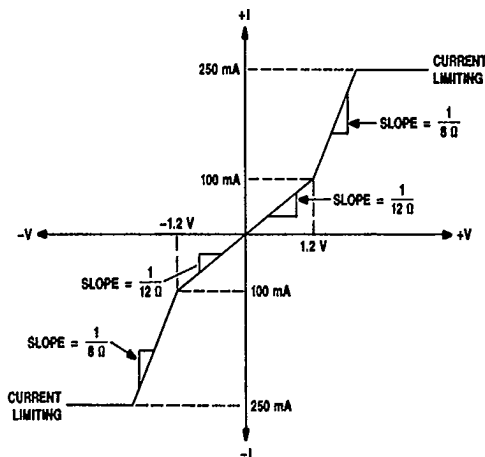


Figure 1. Typical ON Characteristics

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Recommended Operating Conditions

Parameter	Min	Typ	Max	Unit
LED Forward Current for Turn On	6	10	20	mA
dc or Peak Load Current (Each Pole Operating Independently)	—	100	150	mA
dc or Peak Load Current (Each Pole, Two Poles Operating Simultaneously)	—	75	100	mA

Electrical CharacteristicsT_A = 25 °C unless otherwise specified.

Minimum and maximum values are testing requirements. Typical values are characteristics of the device and are the result of engineering evaluations. Typical values are for information purposes only and are not part of the testing requirements.

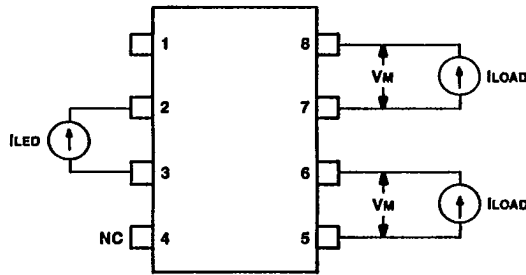
Characteristic	Test Conditions	Min	Typ	Max	Unit
LED Forward Current for Turn-On	I _{LOAD} = 200 mA, 25 °C	—	1.5	2.5	mA
	I _{LOAD} = 160 mA, 70 °C	—	2.5	—	mA
LED ON Voltage @ 10 mA	—	1.15	1.30	1.45	V
ON-Resistance @ 50 mA (Figure 2)	—	8	12	15	Ω
Breakdown Voltage @ 50 μA (Figure 2)	—	200	230	—	V
Output Off-State Leakage Current (Figure 3)	100 V, I _{LED} = 0 μA	—	1.0	—	nA
	100 V, I _{LED} = 200 μA	—	0.1	2.0	μA
Current Limit @ 5 V (Figure 3), t = 10 ms	—	200	250	350	mA
Turn-On Time (Figure 4)	—	—	2.0	—	ms
Turn-Off Time (Figure 4)	—	—	1.0	—	
Feedthrough Capacitance, Pin 5 to 6, Pin 7 to 8 (4 V p-p, 1 kHz)	—	—	35	—	pF
Pole to Pole Capacitance (4 V p-p, 1 kHz)	—	—	20	—	pF
Pole to Pole ON-Resistance matching	—	—	0.2	—	Δ Ω

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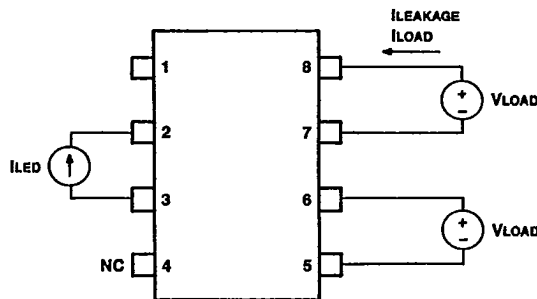
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Test Circuits



I _{LED}	I _{LOAD}	Measure	Parameter
5.0 mA	±50 mA	±V _M	ON-Resistance = $\frac{V_M}{50 \text{ mA}}$
0	±50 μA	±V _M	Breakdown Voltage = V _M

Figure 2. Test Circuit for ON-Resistance and Breakdown Voltage



I _{LED}	V _{LOAD}	Measure	Parameter
0, 200 μA	±100 V	I _L	Leakage = I _L
5.0 mA	±5 V	I _L	Current Limit = I _L

Figure 3. Test Circuit for Leakage and Current Limit

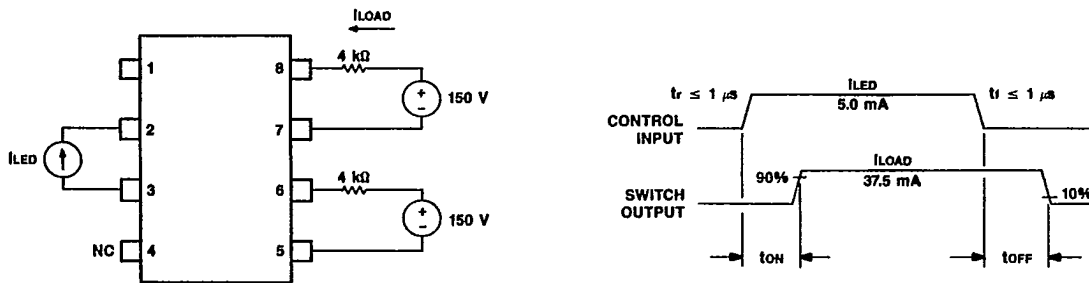


Figure 4. *t_{ON}/t_{OFF}* Test Circuit and Waveform

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Applications

When using a single output, to ensure continuous operation without current limit interaction, limit the operating current to 75% of the device's current limit value at room temperature. When using both outputs simultaneously, limit the operating current to one half of the current limit value of one output.

The outputs of the LH1061AB Relay can also be arranged in series to obtain an overall operating voltage of 400 V. In this configuration, a worst-case current limit will be one half of the current limit of one output. Likewise, the outputs can be arranged in parallel to obtain a higher operating current. In this configuration, a worst-case current limit will be equal to the current limit of one output. For operation at elevated temperature, further decrease the current limit by 1 mA/°C.

When the relay is used for telephone loop applications, overvoltage protection is required. A recommended device is AT&T's LH1150 Integrated Secondary Protector. Another device for protection is a metal-oxide varistor (MOV) as shown in Figure 5. At worst-case fault current, the maximum MOV clamp voltage must be less than 200 V per relay output.

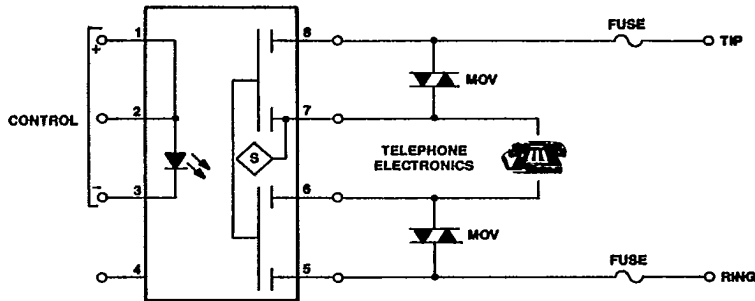
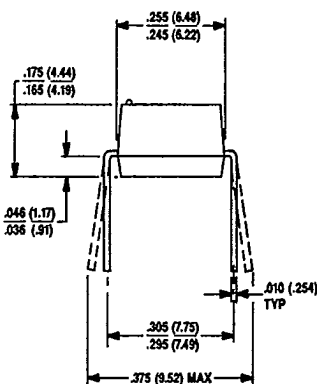
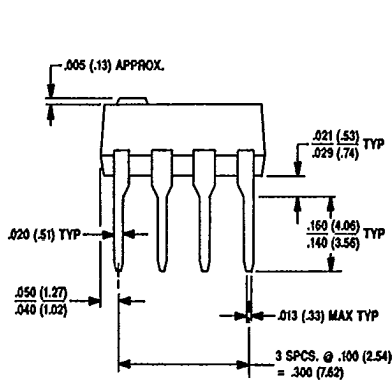
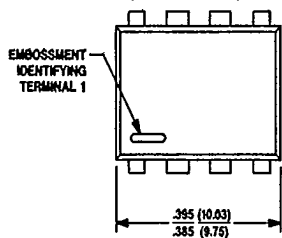


Figure 5. Balanced Switchhook Application

Outline Drawings

8-Pin Plastic DIP

Dimensions are in inches and (millimeters).



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Ordering Information

Device	Comcode
LH1061AB	104384482