Data Sheet

LH1085AT/AAB High-Voltage, Solid-State Relay

Description

The LH1085AT/AAB High-Voltage, Solid-State Relay is a single-pole, normally open switch (1 Form A) that can replace electromechanical relays in many applications. The relay features logic-level input control of isolated high-voltage switch outputs. The output is rated at 350 V and can handle loads up to 135 mA. The relay can switch both ac and dc loads and is ideal for audio frequency or dc applications. Typical ON-resistance at 25 mA is 30 Ω.

The LH1085AT/AAB 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. 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 45 mA. Beyond 45 mA, the incremental resistance decreases, thereby minimizing internal power dissipation. Overload currents are clamped at 300 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. This relay is packaged in a 6-pin, plastic DIP (LH1085AT) or in a 6-pin, surface-mount, gull-wing configuration (LH1085AAB).

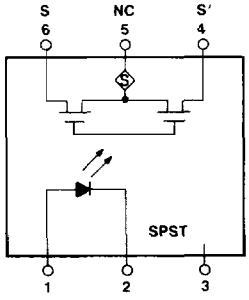
Features

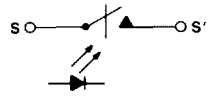
- 1500 Vrms input/output isolation
- Low ON-resistance
- Clean, bounce-free switching
- dv/dt typically better than 500 V/μs
- Low power consumption
- Monolithic IC reliability

Applications

- High-voltage testers
- Industrial controls
- Telecom switching
- Triac predriver
- Isolation switching

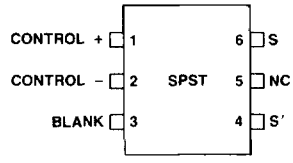
Functional Diagram





EQUIVALENT RELAY DIAGRAM

Pin Diagram



Absolute Maximum Ratings

At 25 ° C

Stresses exceeding the values listed under Absolute Maximum Ratings can 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 can adversely affect the device reliability.

Rating	Symbol	Value	Unit
Ambient Operating Temperature Range	T_A	−40 to +85	° C
Storage Temperature Range	T_{stg}	−40 to +100	° C
Pin Soldering Temperature (t = 7 s max.)	T_S	270	° C
Input/Output Isolation Voltage (t = 60 s min.)	V_{ISO}	1500	Vrms
LED Input Ratings:			
Continuous forward current	I_F	20	mA
Reverse voltage	V_R	10	V
Output Operation:			
dc or peak ac load voltage ($I_L \leq 50\ \mu A$)	V_L	350	V
Continuous dc load current	I_L	135	mA
Peak load current (t = 10 ms)	I_P	400	mA
Power Dissipation	P_{DISS}	500	mW

Recommended Operating Conditions

T_A = 25 ° C unless otherwise specified

Parameter	Symbol	Min	Typ	Max	Unit
LED Forward Current for Switch Turn-on (T_A = −40 ° C to +85 ° C)	I_{FON}	8	10	20	mA
Continuous dc Load Current	I_L	—	45	135	mA
ac rms Load Current	—	—	30	135	mA

Pin Descriptions

Pin	Symbol	Name/Function
1 2	Control + Control −	These pins are the positive and negative inputs to the control LED. An appropriate amount of current through the LED closes the circuit path between S and S′.
6 4	S S′	These pins are the switch 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. This relay pole is normally open unless sufficient control current is flowing.
3	Blank	This pin can be used as a tie-point for external components. Voltage on this pin should not exceed 300 V.
5	NC	This pin is connected to internal circuitry. It should **not** be used as a tie-point for external circuitry.

Characteristics

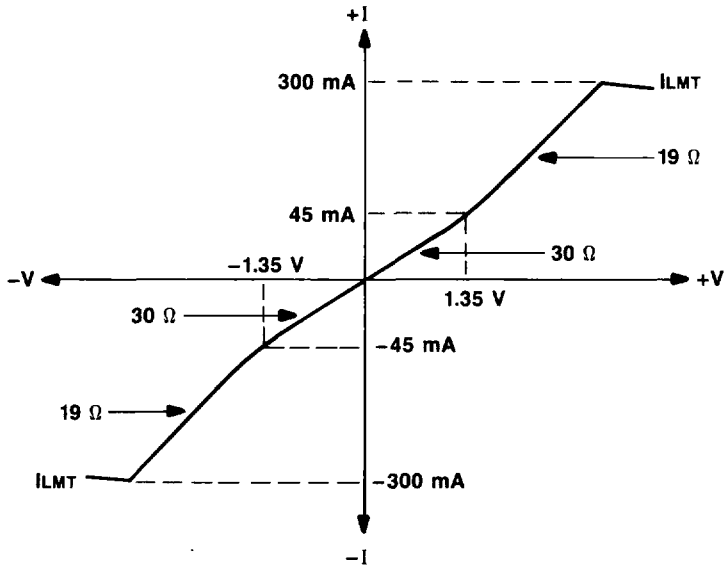


Figure 1. Typical ON Characteristics

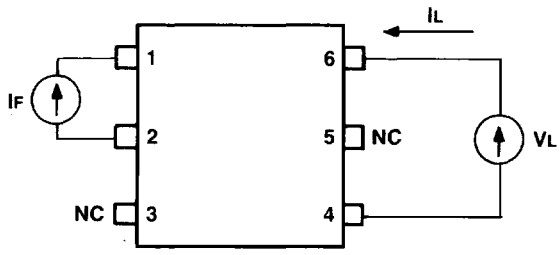
Electrical Characteristics

T_A = 25 °C

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.

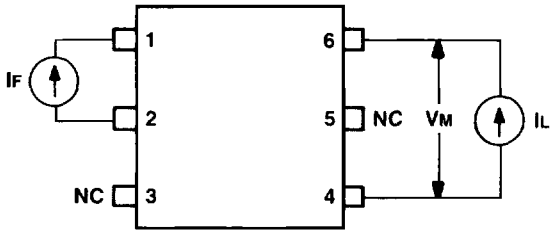
Characteristics	Symbol	Test Condition	Min	Typ	Max	Unit
LED Forward Current for Switch Turn-on	I_{Fon}	I_L (min) = 150 mA, V_L = ±9 V, t = 10 ms (See Figure 2.)	—	1.3	2.5	mA
LED Forward Current for Switch Turn-off	I_{Foff}	I_F = 0.2 mA, V_L = ±300 V (See Figure 2.)	0.2	1.2	—	mA
LED Forward Voltage	V_F	I_F = 10 mA	1.15	1.22	1.45	V
ON-resistance	R_{ON}	I_F = 5 mA, I_L = ±25 mA (See Figure 3.)	20	30	37	Ω
Current Limit	I_{LMT}	I_F = 5 mA, V_L = ±9 V, t = 10 ms (See Figure 4.)	225	300	400	mA
Output Off-state Leakage Current	—	I_F = 0, V_L = ±100 V (See Figure 4.)	—	0.03	200	nA
Turn-on Time	t_{on}	I_F = 5 mA, V_L = +150 V, R_L = 4 kΩ (See Figure 5.)	—	1.4	2.0	ms
Turn-off Time	t_{off}	I_F = 5 mA, V_L = +150 V, R_L = 4 kΩ (See Figure 5.)	—	0.9	2.0	ms
Feedthrough Capacitance Pin 4 to 6	—	I_F = 0, V_L = 4 Vp-p, 1 kHz	—	24	—	pF

Test Circuits



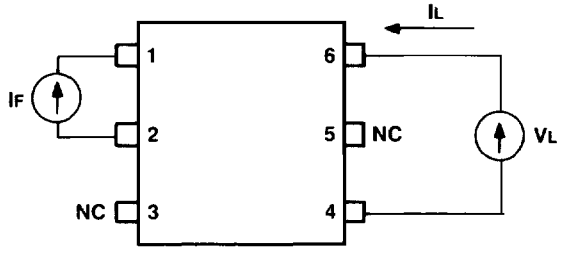
IF	VL	Measure	Parameter
2.5 mA	±9 V	IL	If $\|I_L\| \geq I_L$ (min), then IFon is good.
0.2 mA	±300 V	IL	If $\|I_L\| < 5\ \mu A$, then IFoff is good.

Figure 2. Test Circuit for LED Forward Current for Switch Turn-On/Turn-Off



IF	IL	Measure	Parameter
5.0 mA	±25 mA	±VM	ON-resistance = $\frac{\lvert V_M \rvert}{25\ mA}$

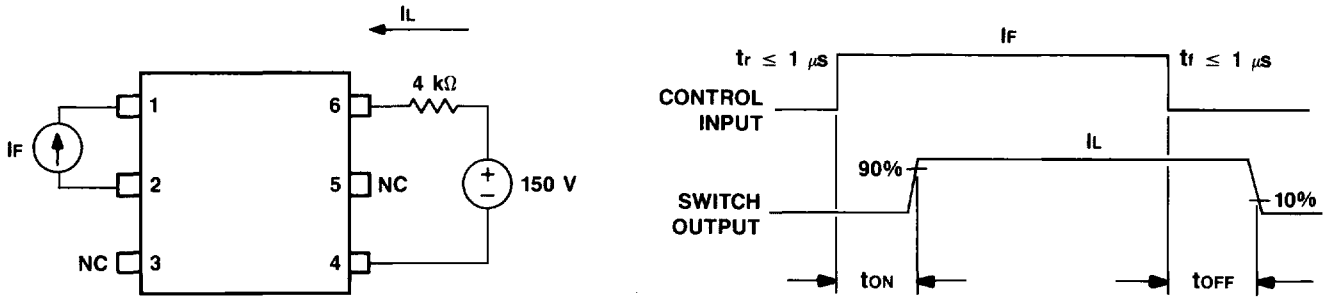
Figure 3. Test Circuit for ON-Resistance



IF	VL	Measure	Parameter
0	±100 V	IL	Leakage = $\|I_L\|$
5.0 mA	±9 V	IL	Current Limit = $\|I_L\|$, t = 10 ms

Figure 4. Test Circuit for Leakage and Current Limit

Test Circuits (continued)



IF	VL	Measure	Parameter
5.0 mA	+150 V	IL	ton/toff = Δt IF to IL

Figure 5. ton/toff Test Circuits and Waveforms

Applications

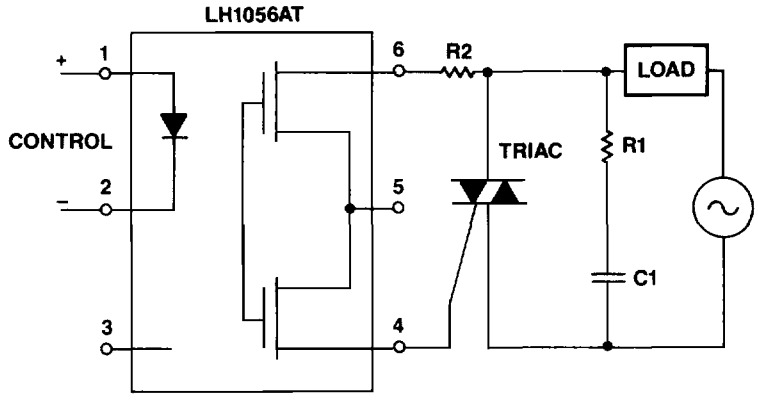
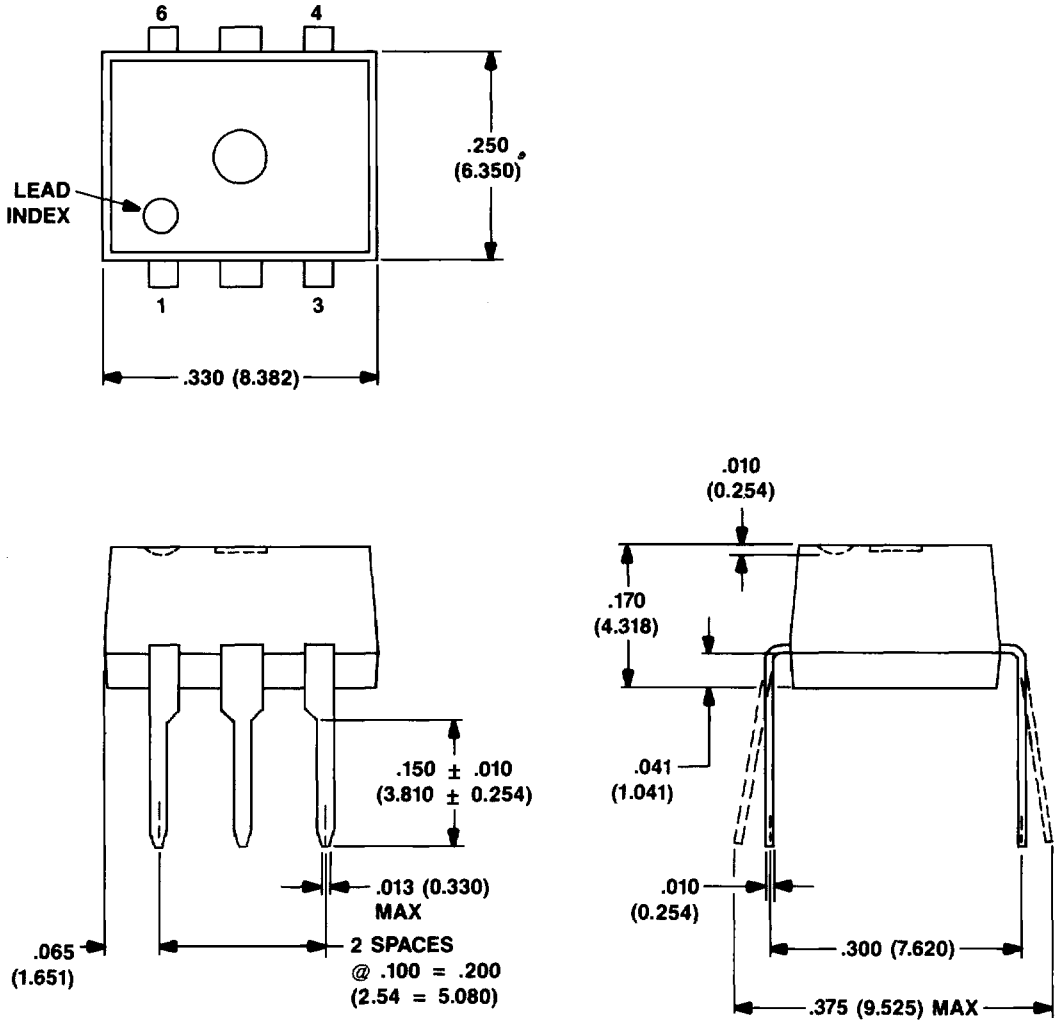


Figure 6. Triac Predriver

Outline Drawings

6-Pin, Plastic DIP (LH1085AT)

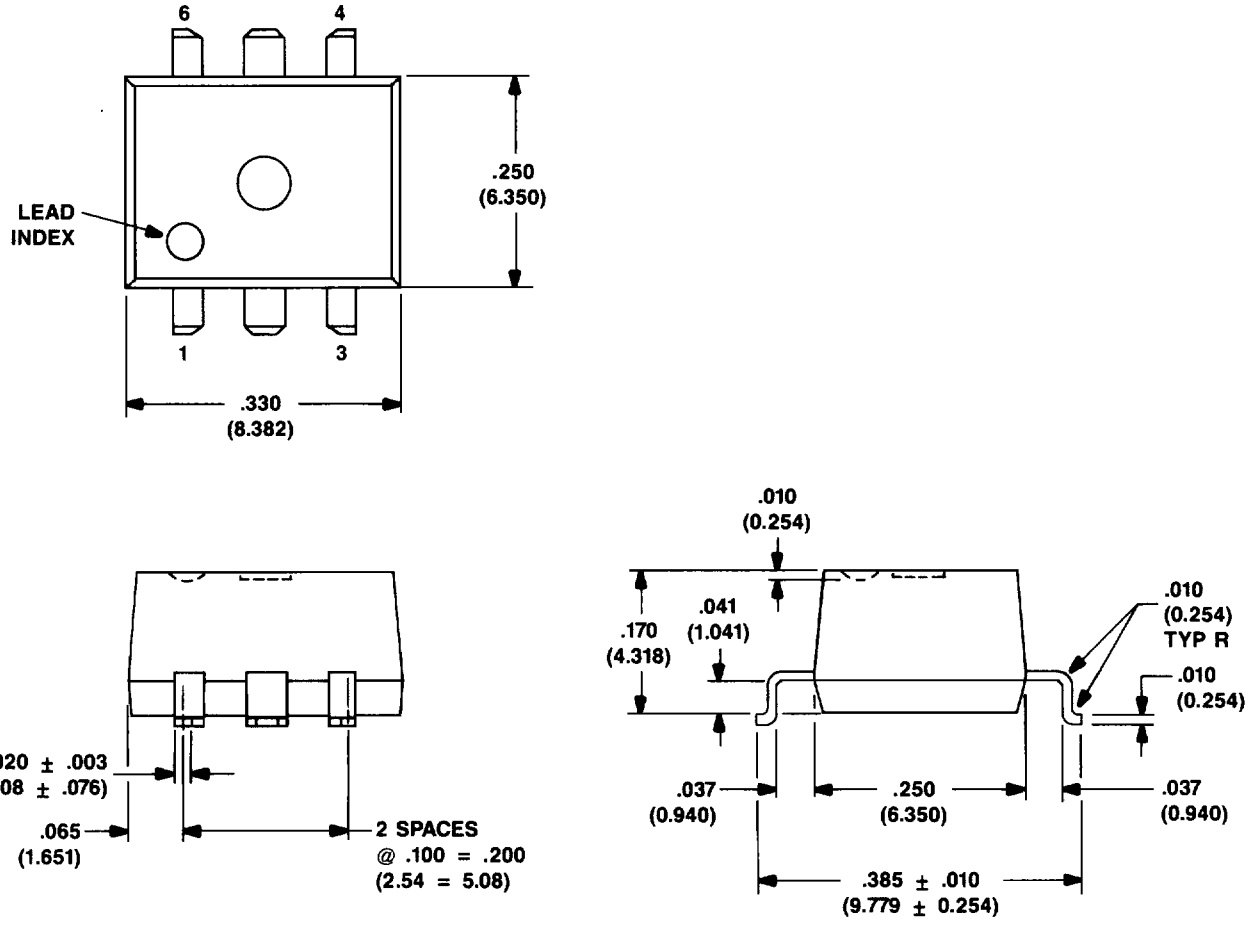
Dimensions are in inches and (millimeters).



Outline Drawings (continued)

6-Pin, Plastic Gull-Wing (LH1085AAB)

Dimensions are in inches and (millimeters).



Ordering Information

Device	Package	Comcode
LH1085AT	6-Pin, Plastic DIP	104395520
LH1085AAB	6-Pin, Plastic Gull-Wing	104395512

For additional information, contact your AT&T Account Manager, or call:

- AT&T Microelectronics
  Dept. 52AL330240
  555 Union Boulevard
  Allentown, PA 18103
  1-800-372-2447

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  AT&T Deutschland GmbH
  Bahnhofstr. 27A
  D-8043 Unterfoehring
  West Germany
  Tel. 089/950 86-0
  Telefax 089/950 86-111
- AT&T Microelectronics Asia/Pacific
  14 Science Park Drive
  #03-02A/04 The Maxwell
  Singapore 0511
  Tel. (65) 778-8833
  FAX (65) 777-7495
  Telex RS 42898 ATTM
- AT&T Microelectronics
  AT&T Japan Ltd.
  31-11, Yoyogi 1-chome
  Shibuya-ku, Tokyo 151
  Japan
  Tel. (03) 5371-2700
  FAX (03) 5371-3556
- AT&T Microelectronica de España
  Albacete, 5 – 2ª
  28027 Madrid
  Spain
  Tel. (34) 1-404 6012
  FAX (34) 1-404 3469
  Telex 41494 AMESP

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