LH1016

ADVANCE DATA
AN AT&T PRODUCT

HIGH-VOLTAGE SOLID-STATE AC/DC RELAY

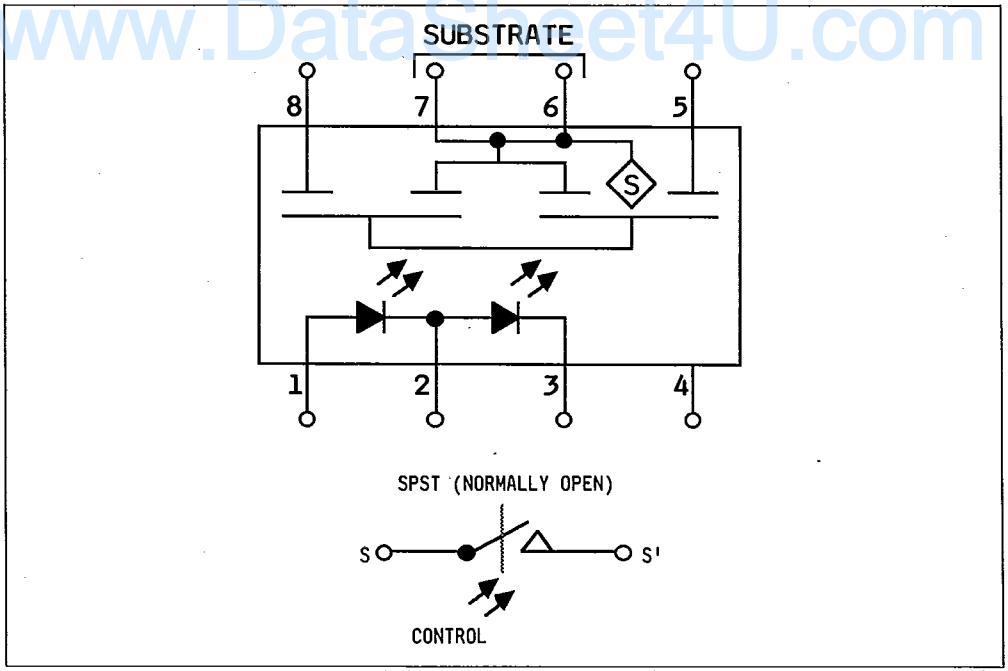
- HIGH-VOLTAGE MONOLITHIC INTEGRATED CIRCUIT FABRICATED IN A DIELETRIC ISOLATION PROCESS
- CAN SWITCH LOADS UP TO 400V AT CURRENTS UP TO 200mA
- LOW ON-RESISTANCE
- CLEAN, BOUNCE-FREE SWITCHING
- NO ELECTROMAGNETIC INTERFERENCE
- 3750V I/O ISOLATION (OPTICALLY COUPLED)
- GOOD dV/dT CAPABILITY
- HIGH-SURGE CAPABILITY
- NOISE-FREE OPERATION
- LOW-POWER CONSUMPTION

MINIDIP-D Plastic

ORDERING NUMBER: LH1016AB

This solid-state device is a high-performance, optically controlled, AC/DC Relay. The LH1016 consists of two GaAlAs light-emitting diodes (LEDs) which optically couples the ON/OFF control signal to a dielectrically isolated high-voltage integrated circuit. The integrated circuit contains the high-voltage DMOS transistors and photosensitive drive circuitry. The optical isolation ensures excellent noise immunity with up to 3750 volts of isolation between input and output, while the LED control currents can be as low as 5.0mA. This makes the LH1016 suitable for logic control. Equivalent relay diagrams for this device is shown in Figure 1.

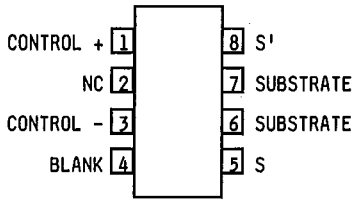
Fig. 1 - Functional and Equivalent Diagram



This is advanced information on a new product now in development or undergoing evaluation. Details are subject to change without notice.

LH1016

PIN CONFIGURATION



PIN DESCRIPTION

Name	Description
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, S',	These pins are the outputs.
NC	This pin is connected internally for test purposes. It should NOT be used as a tie-point for external components.
Blank	This pin may be used as a tie point for external components. Voltage applied to this pin should not exceed 150V.
Substrate	This pin should be left unconnected.

ABSOLUTE MAXIMUM RATINGS (at 25°C unless otherwise specified)

Parameter	Value	Unit
Ambient Operating Temperature Range	0 to +70	°C
Storage Temperature Range	−40 to +100	°C
Pin Soldering Temperature (t = 15 s max)	300	°C
Input/Output Voltage Isolation	3750	V
LED INPUT		
Continuous Forward Current	25	mA
Peak Forward Surge Current	250	mA
[Pulse width = 4.0ms, 10 pulses/s cycle (4%)]		
Reverse Voltage	20	V
OUTPUT, Continuous Current (RMS)	200	mA

Stresses in excess of those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions in excess of those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

ELECTRICAL CHARACTERISTICS (at 25°C unless otherwise specified)

Parameter		Test Conditions	Min	Typ	Max	Unit
OUTPUT POLE						
ON Resistance $R_{ON} = V_M/50mA$		$I_{LED} = 5mA$, $I_{LOAD} = \pm 50mA$ (See Fig. 2)	—	35	40	Ω
ON Voltage		$I_{LED} = 5mA$, $I_{LOAD} = \pm 200mA$ (See Fig. 2)	—	2.0	2.5	V
Breakdown Voltage		$I_{LED} = 0mA$, $I_{LOAD} = \pm 50\mu A$ (See Fig. 2)	400	—	—	
Surge Current		Non-Recurrent 1.0ms square wave $I_{LED} = 5.0mA$ (See Fig. 2)	4.0	—	—	A
Leakage Current		$V_{LOAD} = 400V$ $I_{LED} = 0mA$ (See Fig. 3)	—	—	20	μA
		$V_{LOAD} = 100V$ $I_{LED} = 0mA$ (See Fig. 3)	—	0.5	—	
Switching Time	TURN ON	$V_M = \pm 150V$ $R_L = 15K\Omega$ (See Fig. 4)	—	—	1.2	msec
	TURN OFF	$V_M = \pm 150V$ $R_L = 15K\Omega$ (See Fig. 4)	—	—	0.8	
INPUT CONTROL						
LED Forward Voltage		Forward Current = 10mA	1.17	—	1.43	V
LED Breakdown Voltage		Reverse Current = 10μA	10	—	—	
LED Reverse Leakage Current		Reverse Voltage = 10V	—	—	10	μA
LED Continuous Forward Current: Recommended Forward Current for ON-State Operation:			(See Absolute Maximum Rating) —	5.0	—	mA

TEST CIRCUITS

Fig. 2 - R_{ON}, ON Voltage and Breakdown Voltage

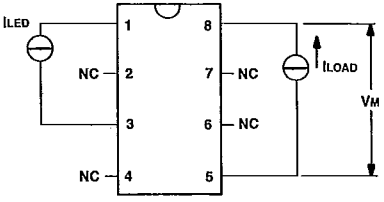


Fig. 3 - Leakage Current

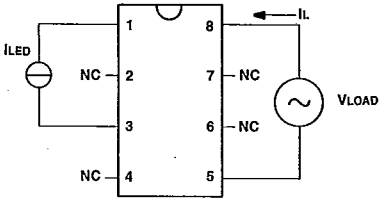
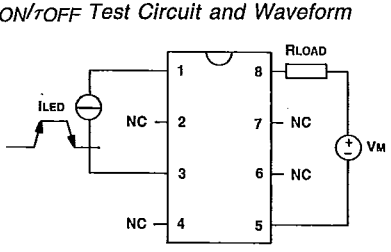
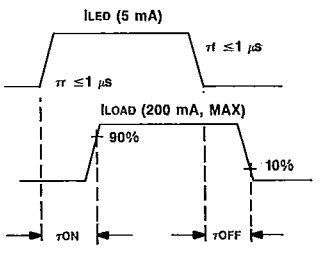


Fig. 4 - $\tau ON/\tau OFF$ Test Circuit and Waveform





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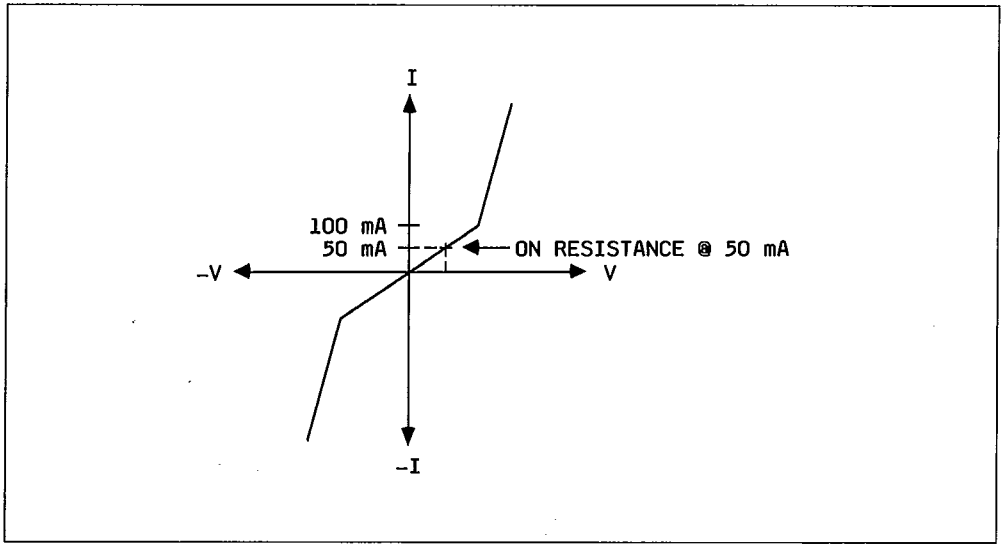
CHARACTERISTIC CURVES

Fig. 5 - ON-State Characteristics of Output Poles (Illustrating Bidirectional V-I Characteristics)



DEVICE OPERATION

In the OFF-state, this device can withstand its rated voltage at leakage currents less than 20 μA. In the ON-state, this device exhibits a bidirectional resistive characteristic for currents less than 100 mA (see Figure 5 for ON-state characteristics). This device can switch up to 400 volts at currents up to 200mA.
This one-pole relay offers one of the highest voltage capabilities for a device in its class. Rated at 400 volts, it is particularly suitable for 240 Vrms loads which appear widely in many industrial applications. Despite the higher voltage rating, this device still features ON resistance of only 40Ω maximum. This device will pass surge current up to 4A for 1ms.

APPLICATION

This device has been optimized to meet the demands of switching high voltages at moderate current levels in applications such as telecommunications, instrumentation, and medium-power switching. It is ideally suited for applications where high performance, noise-free switching of ac and dc signals is desirable.
The operational range of this device includes low-power commercial voltage applications where milampere control signals and low ON-resistance are required. The speed, reliability, and linearity of this switch makes it well suited for those applications which are beyond the range of mechanical relays, thyristors, and triacs. For lower ON resistance, higher voltages, or greater current capability, the LH1016 can be easily combined in parallel or series arrangements, as required, with their control LEDs simply driven in series.
The low ON-resistance and low-noise features are beneficial in instrumentation applications. The optical coupling provides isolation of the switch from the control signals in high-voltage and high-frequency applications.
The fabrication of high-voltage, monolithic ICs in a unique dielectric isolation process provides high reliability and the solid-state contruction eliminates problems associated with mechanical relays such as sensitivity to shock and vibration.

Fig. 6 - Typical Application as a Triac Predriver

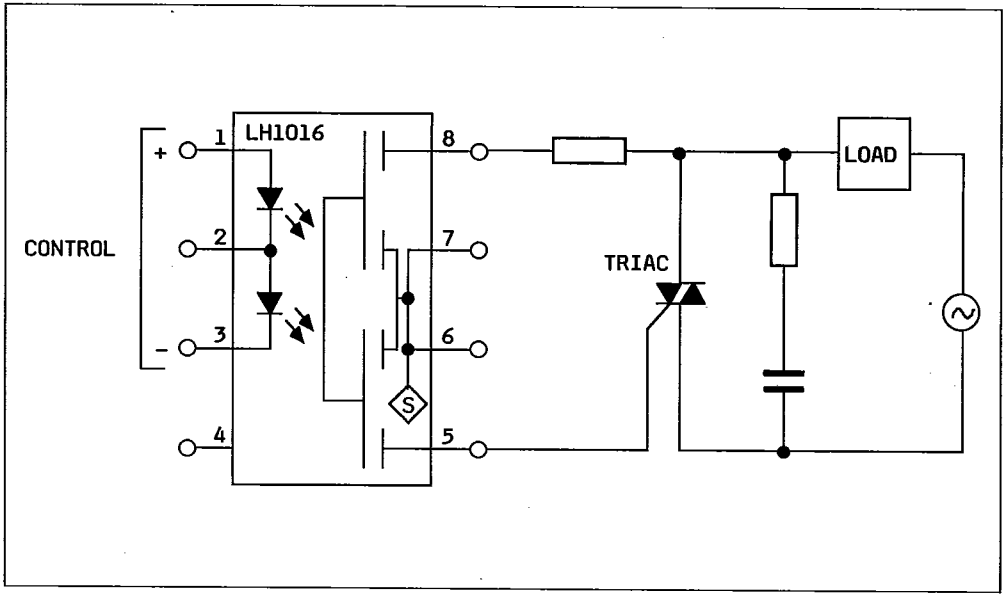


Fig. 7 - Single-Line Switchhook Application