



# LH1500AT/AAB/AABTR

1 Form A  
Solid State Relay

## FEATURES

- Current Limit Protection
- I/O Isolation, 5300 V<sub>RMS</sub>
- Typical R<sub>ON</sub> 20 Ω
- Load Voltage 350 V
- Load Current 150 mA
- High Surge Capability
- Linear, AC/DC Operation
- Clean Bounce Free Switching
- Low Power Consumption
- High Reliability Monolithic Receptor
- SMD Lead Available on Tape and Reel
- Flammability; UL94, VØ

## AGENCY APPROVALS

- UL – File No. E52744
- BSI/BABT Cert. No. 7980
- FIMKO Approval
- CSA – Certification 093751

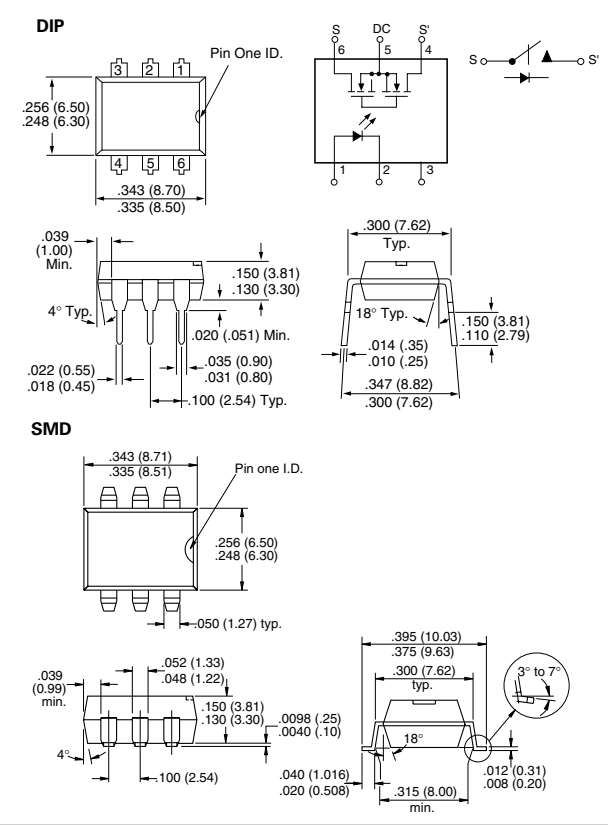
## APPLICATIONS

- General Telecom Switching
  - On/off Hook Control
  - Ring Delay
  - Dial Pulse
  - Ground Start
  - Ground Fault Protection
- Instrumentation
- Industrial Controls
- See Application Note 56

## DESCRIPTION

The LH1500 is robust, ideal for telecom and ground fault applications. It is a SPST normally open switch (1 Form A) that replaces electromechanical relays in many applications. It is constructed using a GaAlAs LED for actuation control and an integrated monolithic die for the switch output. The die, fabricated in a high-voltage dielectrically isolated technology, is comprised of a photodiode array, switch control circuitry and MOSFET switches. In addition, it employs current-limiting circuitry which meets FCC 68.302 and other regulatory voltage surge requirements when overvoltage protection is provided.

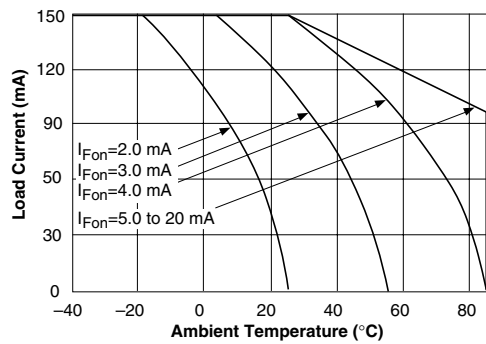
Package Dimensions in Inches (mm)



## Part Identification

Part Number	Description
LH1500AT	6-pin DIP, Thru Hole
LH1500AAB	6-pin SMD
LH1500AABTR	6-pin SMD, Tape and Reel

### Recommended Operating Conditions



### Absolute Maximum Ratings, $T_A=25^\circ\text{C}$

Stresses in excess of the Absolute Maximum Ratings can cause permanent damage to the device. These are absolute stress ratings only. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of the data sheet. Exposure to maximum rating conditions for extended periods can adversely affect device reliability.

Ambient Temperature Range .....	-40 to +85°C
Storage Temperature Range .....	-40 to +150°C
Soldering Temperature (t=10 s max.) .....	260°C
Isolation Test Voltage (for 1.0 s) .....	5300 V <sub>RMS</sub>
Isolation Resistance	
$V_{IO}=500\text{ V}, T_A=25^\circ\text{C}$ .....	$\geq 10^{12}\ \Omega$
$V_{IO}=500\text{ V}, T_A=100^\circ\text{C}$ .....	$\geq 10^{11}\ \Omega$
SSR Output Power Dissipation (continuous).....	550 mW
LED Continuous Forward Current .....	50 mA
LED Reverse Voltage ( $I_F \leq 10\text{ mA}$ ) .....	8.0 V
DC or Peak AC Load Voltage ( $I_L \leq 50\text{ mA}$ ) .....	350 V
Continuous DC Load Current at 25°C	
Bidirectional.....	150 mA
Unidirectional.....	250 mA

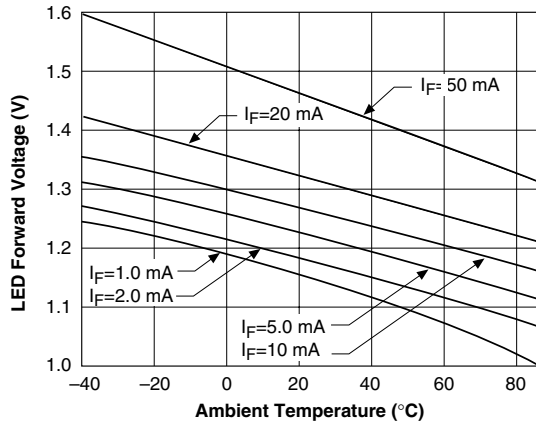
### Electrical Characteristics, $T_A=25^\circ\text{C}$

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 only and are not part of the testing requirements.

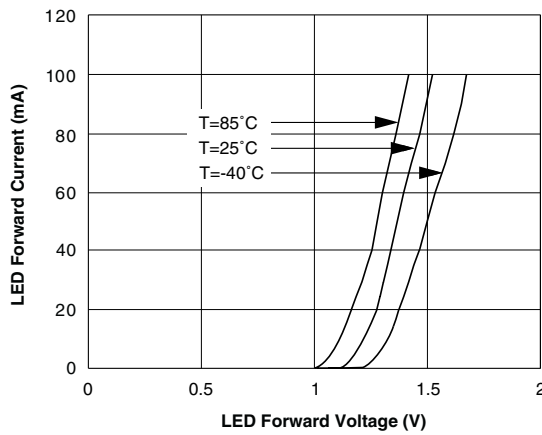
Parameter	Symbol	Min.	Typ.	Max.	Units	Test Conditions
<b>Input</b>						
LED Forward Current, Switch Turn-on	$I_{Fon}$	—	0.9	2.0	mA	$I_L=100\text{ mA}, t=10\text{ ms}$
LED Forward Current, Switch Turn-off	$I_{Foff}$	0.2	0.8	—	mA	$V_L \pm 300\text{ V}$
LED Forward Voltage	$V_F$	1.15	1.25	1.45	V	$I_F=10\text{ mA}$
<b>Output</b>						
ON-resistance, ac/dc: Pin 4 ( $\pm$ ) to 6 ( $\pm$ )	$R_{ON}$	—	18	25	$\Omega$	$I_F=5.0\text{ mA}, I_L=50\text{ mA}$
ON-resistance, dc: Pin 4, 6 (+) to 5 (-)		3.0	4.6	6.25	$\Omega$	$I_F=5.0\text{ mA}, I_L=100\text{ mA}$
OFF-resistance	$R_{OFF}$	0.5	300	—	G $\Omega$	$I_F=0\text{ mA}, V_L=\pm 100\text{ V}$
Current Limit ac/dc pin 4 ( $\pm$ ) to 6 ( $\pm$ )	$I_{LMT}$	230	255	370	mA	$I_F=5.0\text{ mA}, t=5.0\text{ ms}$ $V_L \pm 6.0\text{ V}$
Off-state Leakage Current	$I_O$	—	0.32	200	nA	$I_F=0\text{ mA}, V_L=\pm 100\text{ V}$
		—	73.4	1.0	mA	$I_F=0\text{ mA}, V_L=\pm 350\text{ V}$
Output Capacitance, Pin 4 to 6	$C_O$	—	33	—	pF	$I_F=0\text{ mA}, V_L=1.0\text{ V}$
		—	10	—	pF	$I_F=0\text{ mA}, V_L=50\text{ V}$
Switch Offset	$V_{OS}$	—	0.2	—	$\mu\text{V}$	$I_F=5.0\text{ mA}$
<b>Transfer</b>						
Input/Output Capacitance	$C_{ISO}$	—	0.71	—	pF	$V_{ISO}=1.0\text{ V}$
Turn-on Time	$t_{on}$	—	0.338	2.0	ms	$I_F=5.0\text{ mA}, I_L=50\text{ mA}$
Turn-off Time	$t_{off}$	—	0.63	2.0	ms	$I_F=5.0\text{ mA}, I_L=50\text{ mA}$

**Typical Performance Characteristics**

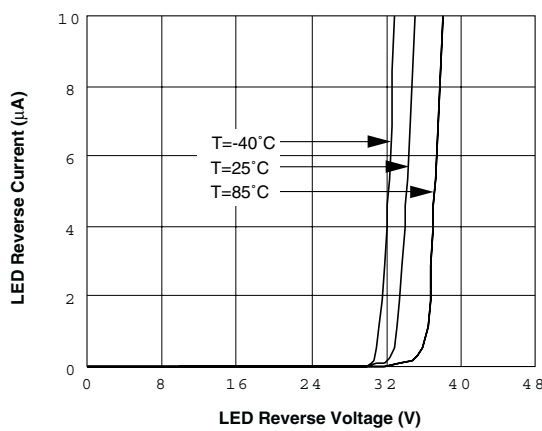
**Figure 1. LED Voltage vs. Temperature**



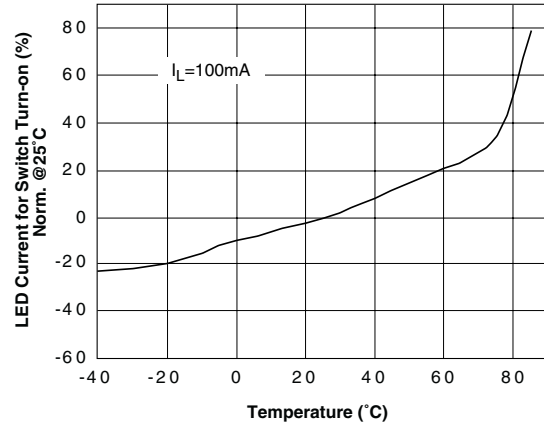
**Figure 2. LED Forward Current vs. LED Forward Voltage**



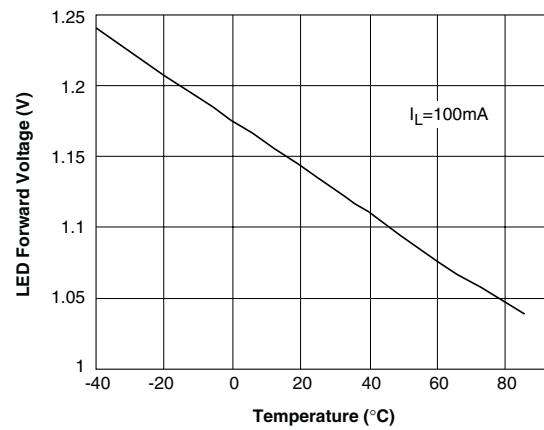
**Figure 3. LED Reverse Current vs. LED Reverse Voltage**



**Figure 4. LED Current for Switch Turn-on vs. Temperature**



**Figure 5. LED Dropout Voltage vs. Temperature**



**Figure 6. Current Limit vs. Temperature**

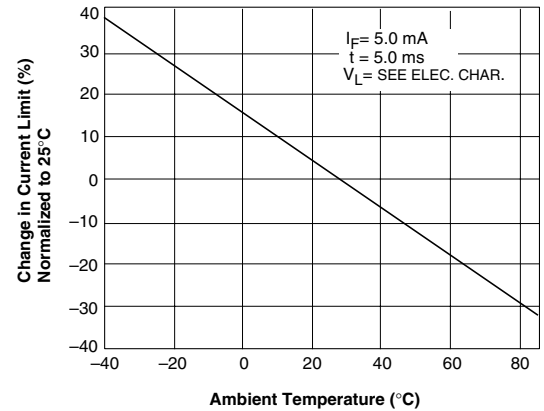


Figure 7. Load Current vs. Load Voltage

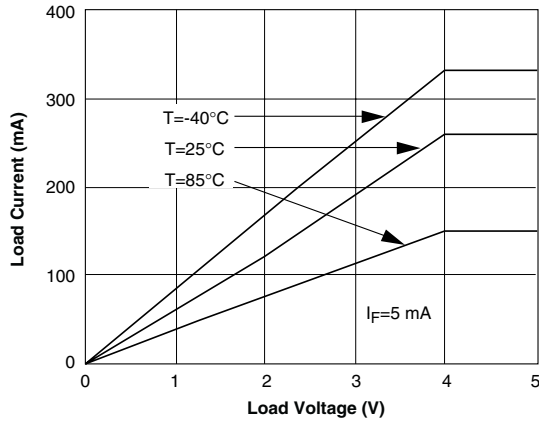


Figure 10. Switch Capacitance vs. Applied Voltage

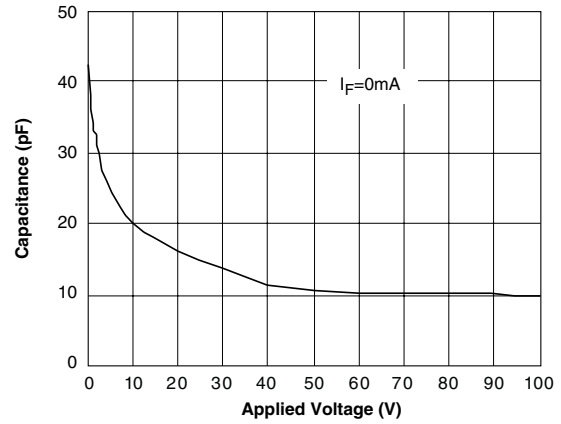


Figure 8. ON-Resistance vs. Temperature

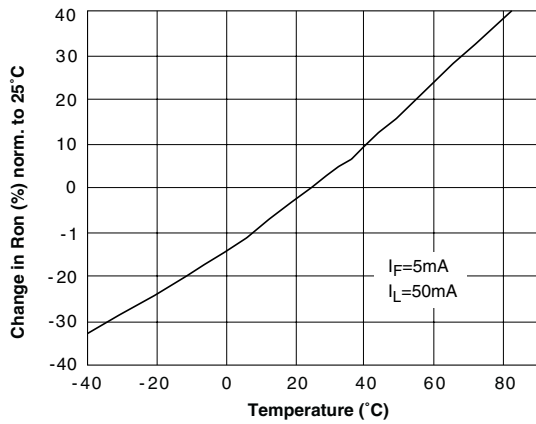


Figure 11. Insertion Loss vs. Frequency

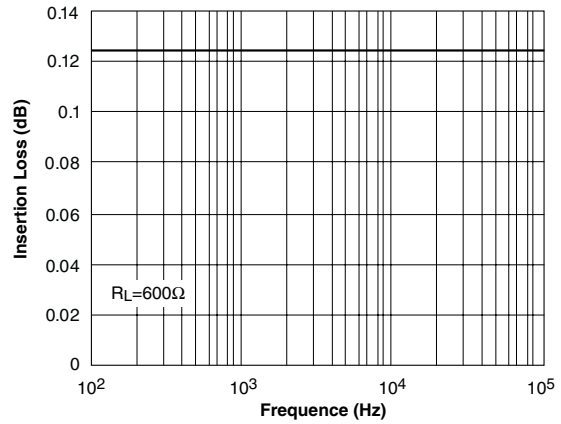


Figure 9. Variation in ON-Resistance vs. LED Current

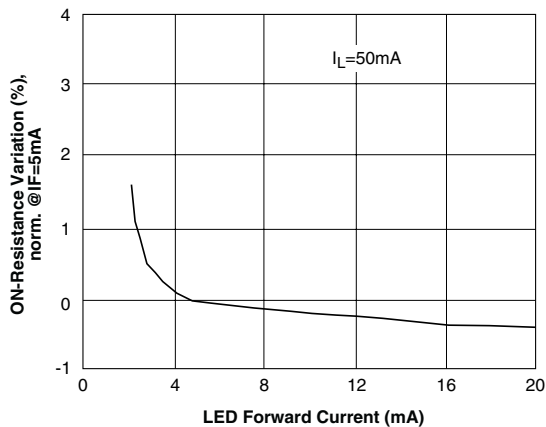


Figure 12. Leakage Current vs. Applied Voltage

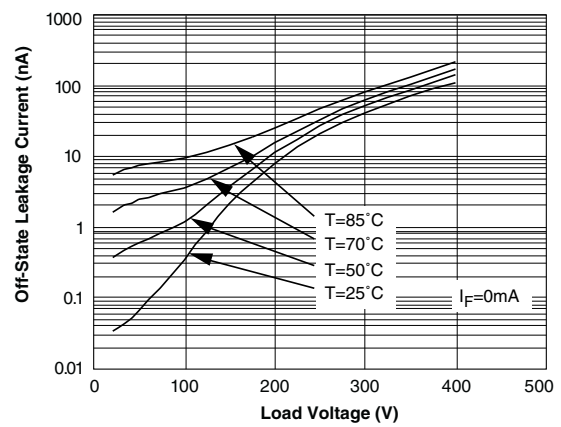


Figure 13. Output Isolation

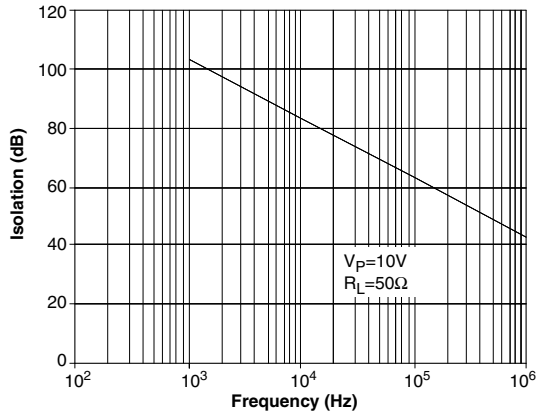


Figure 16. Switch Offset Voltage vs. Temperature

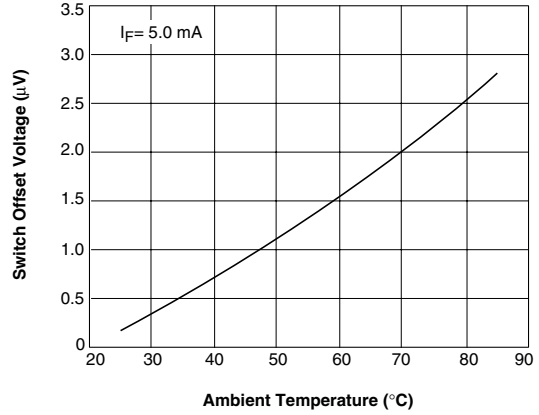


Figure 14. Switch Breakdown Voltage vs. Load Current

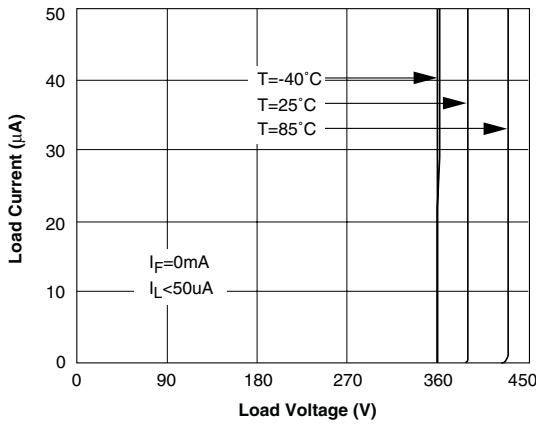


Figure 17. Switch Offset Voltage vs. LED Current

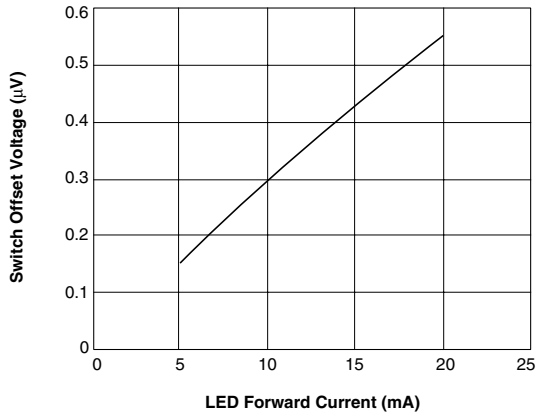


Figure 15. Switch Breakdown Voltage vs. Temperature

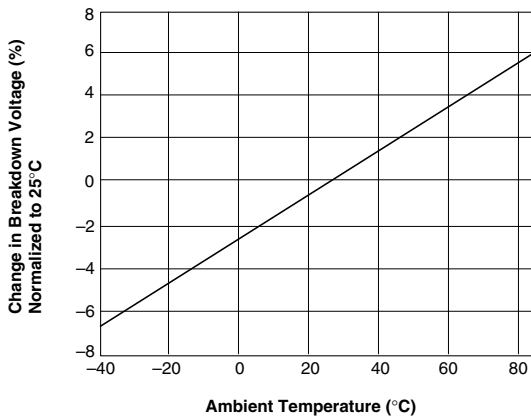


Figure 18. Turn-On Time vs. Temperature

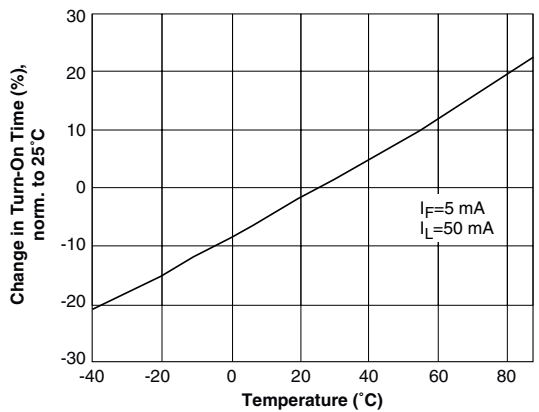


Figure 19. Turn-Off Time vs. Temperature

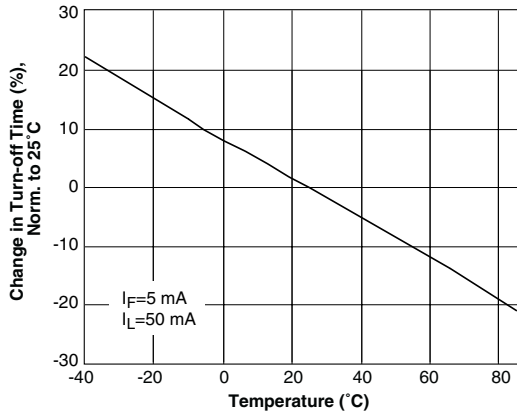


Figure 21. Turn-Off Time vs. LED Current

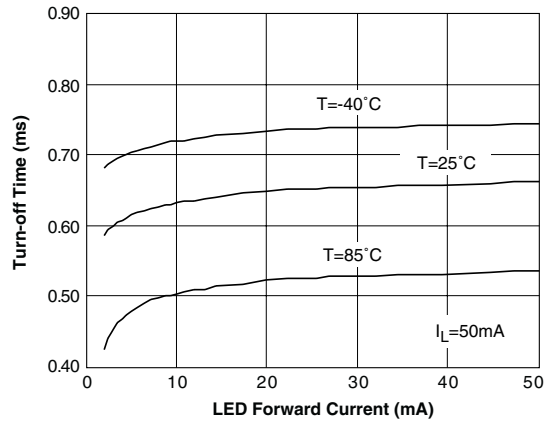


Figure 20. Turn-On Time vs. LED Current

