SIEMENS

LH1525
LH1526

1 Form A, Dual 1 Form A High-Voltage Solid State Relays

FEATURES

	LH1525	LH1526	Units
Load Voltage	400	400	V
Load Current ac/dc dc	 120 250	 120 250	 mA mA
Typical R_{ON}	25	25	Ω
Typical Operating Current	500	500	µA
t_{on}/t_{off} (max)	0.8/0.4	0.8/0.4	ms
Current Limit: ac/dc	 Yes	 Yes	 —

- Extremely low operating current
- High-speed operation
- 3750 Vrms I/O isolation
- Current-limit protection
- High surge capability
- Linear, ac/dc operation
- dc-only option
- Clean, bounce-free switching
- Low power consumption
- High-reliability monolithic receptor
- Surface-mountable

APPLICATIONS

- General telecom switching:
  - Telephone line interface
  - On/off hook
  - Ring relay
  - Break switch
  - Ground start
- Battery-powered switch applications
- Industrial controls:
  - Microprocessor control of solenoids, lights, motors, heaters, etc.
- Programmable controllers
- Instrumentation

DESCRIPTION

The LH1525 and LH1526 relays as SPST normally open switches (1 Form A) that can replace electromechanical relays in many applications. The relays require a minimal amount of LED drive current to operate, making it ideal for battery-powered and power consumption sensitive applications. The relay 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 BCDMOS technology, comprised of a photo-diode array, switch-control circuitry, and MOSFET switches. In addition, the relay employs current-limiting circuitry, enabling it to pass FCC 68.302 and other regulatory surge requirements when overvoltage protection is provided. The relay can be configured for ac/dc or dc-only operation.

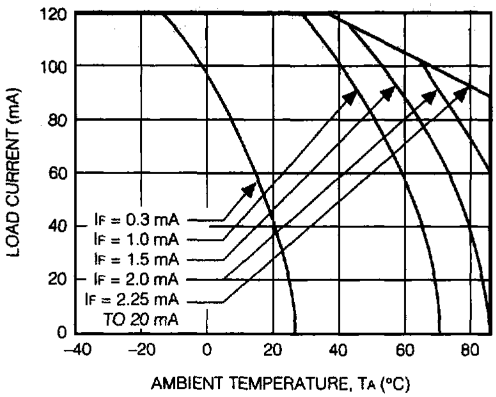
The LH1525 is packaged in a 6-pin, plastic DIP (LH1525AT) or in a surface-mount gull wing (LH1525AAB). The LH1526 is packaged in a 8-pin, plastic DIP (LH1526AB) or in a surface-mount gull wing (LH1526AAC). Both devices are available in sticks or on tape and reel.

Absolute Maximum Ratings T_A=25°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 Absolute Maximum Ratings for extended periods can adversely affect device reliability.

Parameter	**Symbol**	**Value**	**Unit**
Ambient Operating Temperature Range	T_A	–40 to +85	°C
Storage Temperature Range	T_{stg}	–40 to +150	°C
Pin Soldering Temperature (t=10 s max.)	T_S	260	°C
Input/Output Isolation Test Voltage (t=1 sec)	V_{ISO}	5300	Vrms
LED Input Ratings:			
Continuous Forward Current	I_F	50	mA
Reverse Voltage	V_R	8	V
Output Operation LH1525, LH1526 (ea. ch.):			
dc or Peak ac Load Voltage (I_L=≤50 µA)	V_L	400	V
Continuous dc Load Current:			
Bidirectional Operation, Pin 4 to 6 (LH1525)	I_L	125	mA
Unidirectional Operation, Pins 4, 6 (+) to Pin 5 (–)	I_L	250	mA
Two Role Operation (LH1526 only)	I_L	100	mA
Power Dissipation:			
LH1525	P_{DISS}	550	mW
LH1526	P_{DISS}	600	mW

Recommended Operating Conditions

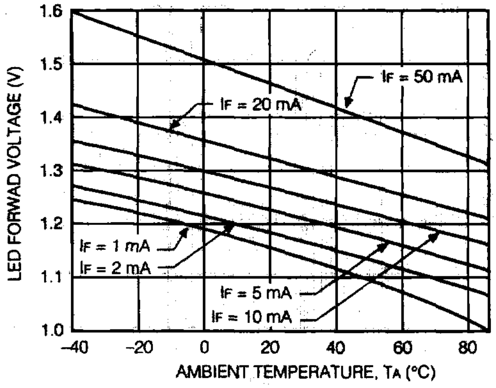


Electrical Characteristics T_A=25°C
Mimimum and maximum values are testing requirements. Typical values are characteristics of the device and are the result of engineering evaluations. Typical values are for information purposes only and are not part of the testing requirements.

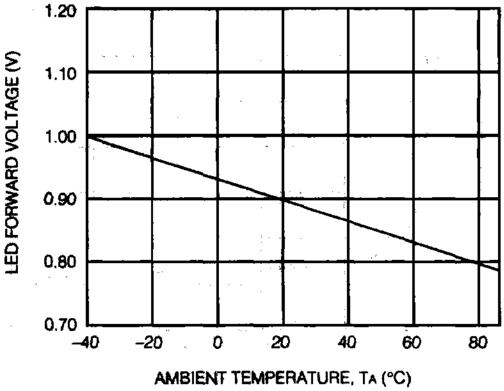
Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Input						
LED Forward Current for Switch Turn-on	I_{Fon}	I_L=100 mA, t=10 ms	—	0.3	0.5	mA
LED Forward Current for Switch Turn-off	I_{Foff}	V_L= ±350 V, t=100 ms	0.001	0.1	—	mA
LED Forward Voltage	V_F	I_F=1.5 mA	0.80	1.15	1.40	V
Output						
ON-resistance:	R_{ON}					
ac/dc, each pole		I_F=1.5 mA, I_L=±50 mA	17	25	33	Ω
dc Pins 4, 6 (+) to 5 (–) (LH1525 only)		I_F=1.5 mA, I_L=100 mA	4.25	6.25	8.25	Ω
OFF-resistance	R_{OFF}	I_F=0 mA, V_L=±100 V	—	5000	—	GΩ
Current Limit	I_{LMT}	I_F=1.5 mA, t=5 ms, V_L=7 V	170	210	270	mA
Output Off-state Leakage Current	—	I_F=0 mA, V_L=±100 V	—	0.04	200	nA
		I_F=0 mA, V_L=±400 V	—	—	1.0	µA
Output Capacitance	—	I_F=0 mA, V_L=1 V	—	37	—	pF
		I_F=0 mA, V_L=50 V	—	13	—	pF
Switch Offset	—	I_F=5 mA	—	0.25	—	µV
Transfer						
Input/Output Capacitance	C_{ISO}	V_{ISO}=1 V	—	0.8	—	pF
Turn-on Time	t_{on}	I_F=1.5 mA, I_L=50 mA	—	1.00	—	ms
		I_F=5.0 mA, I_L=50 mA	—	0.25	0.8	ms
Turn-off Time	t_{off}	I_F=1.5 mA, I_L=50 mA	—	0.20	—	ms
		I_F=5.0 mA, I_L=50 mA	—	0.25	0.4	ms

Typical Performance Characteristics

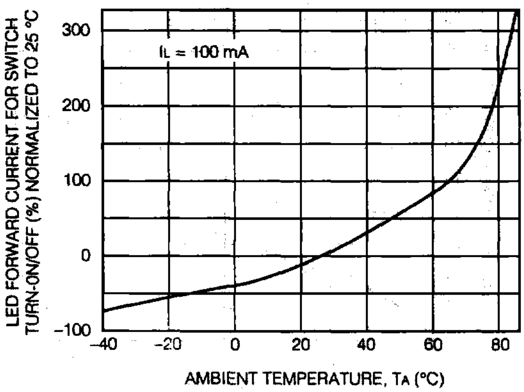
A. LED Voltage vs. Temperature



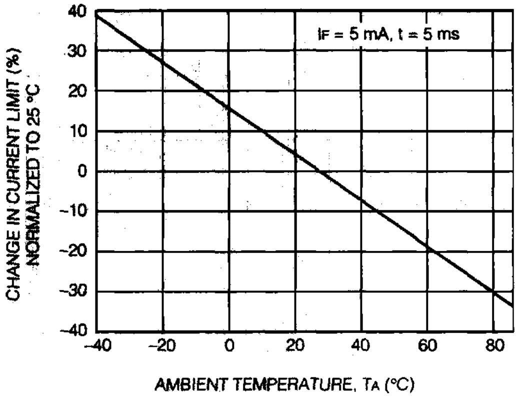
B. LED Dropout Voltage vs. Temperature



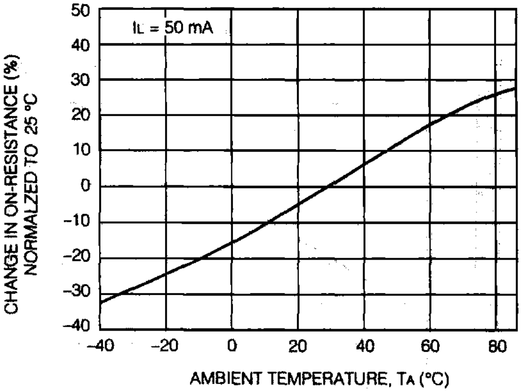
C. LED Current for Switch Turn-On/Off vs. Temperature



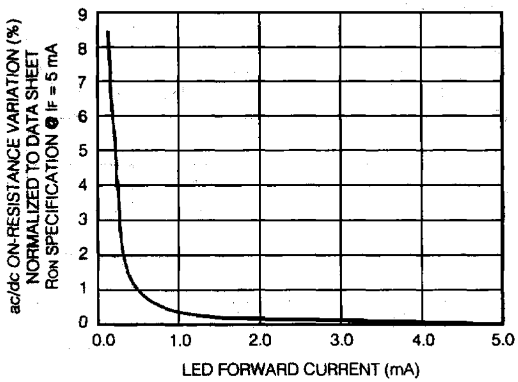
D. Current Limit vs. Temperature



E. ON-Resistance vs. Temperature

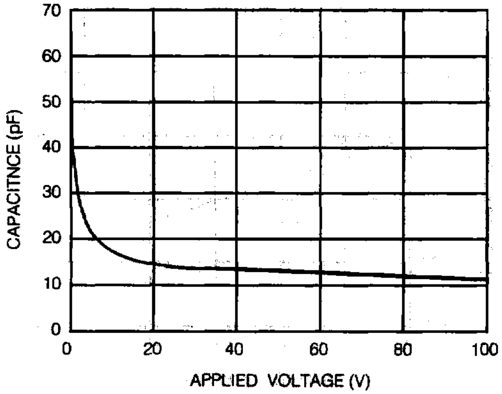


F. Variation in ON-Resistance vs. LED Current

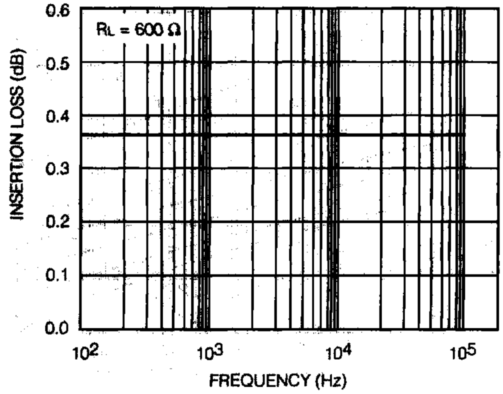


Typical Performance Characteristics (continued)

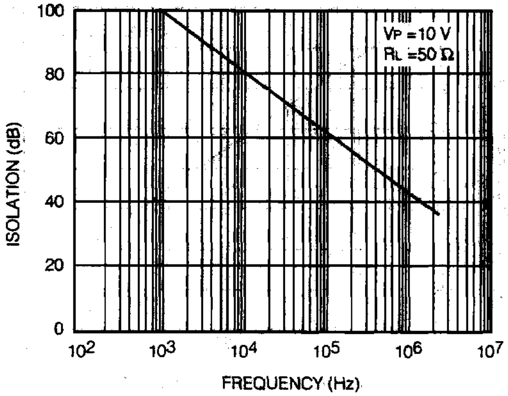
A. Switch Capacitance vs. Applied Voltage



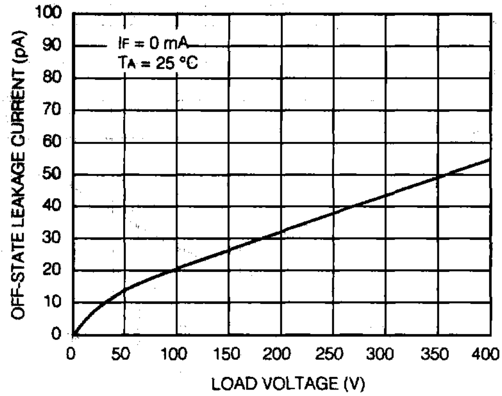
B. Insertion Loss vs. Frequency



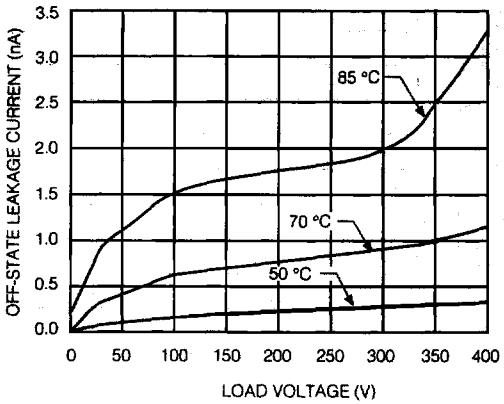
C. Output Isolation



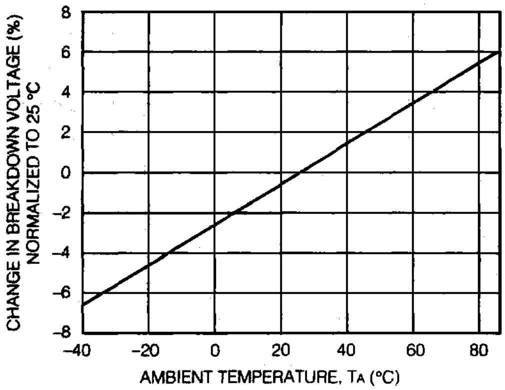
D. Leakage Current vs. Applied Voltage



E. Leakage Current vs. Applied Voltage at Elevated Temperatures

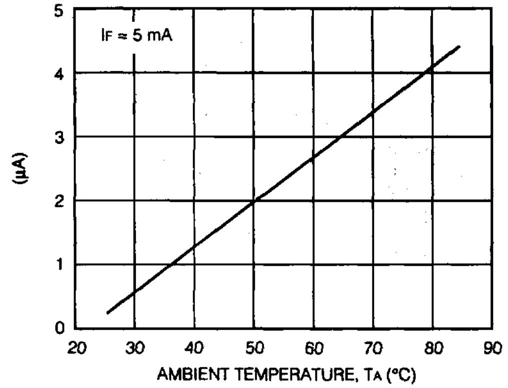


F. Switch Breakdown Voltage vs. Temperature

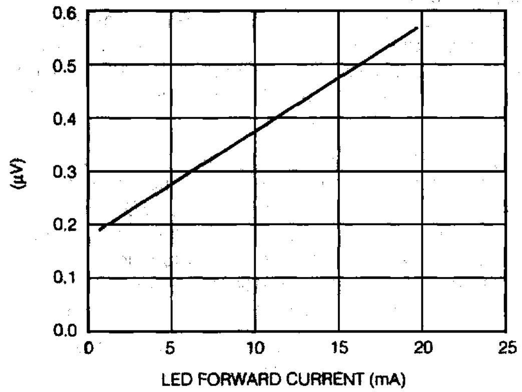


Typical Performance Characteristics (continued)

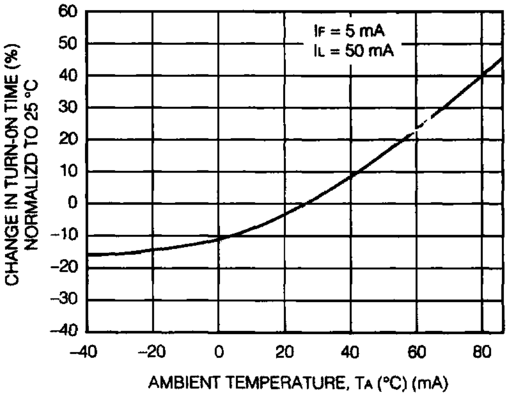
A. Switch Offset Voltage vs. Temperature



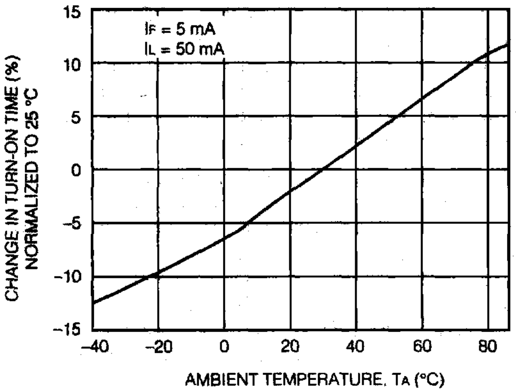
B. LED Offset Voltage vs. LED Current



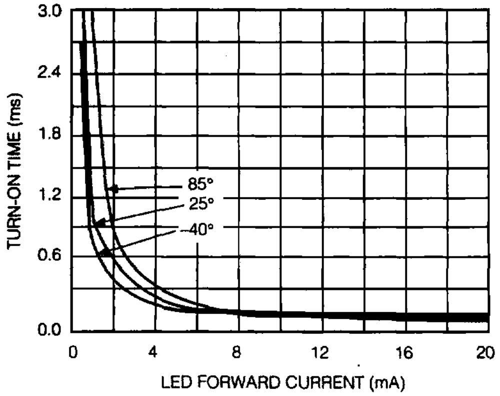
C. Turn-On Time vs. Temperature



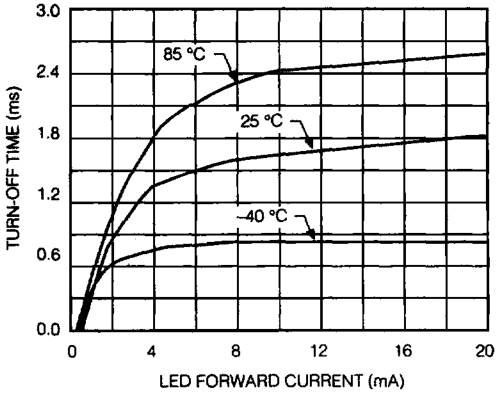
D. Turn-Off Time vs. Temperature



E. Turn-On Time vs. LED Current



F. Turn-off Time vs. LED Current



APPLICATIONS

Input Control

The LH1525 low turn-on current SSR has highly sensitive photo-detection circuits that will detect even the most minute currents flowing through the LED. Leakage current must be considered when designing a circuit to turn on and off these relays.

Figure 23 shows a typical logic circuit for providing LED drive current. R1 is the input resistor that limits the amount of current flowing through the LED. For 5 V operation, a 2700 Ω resistor will limit the drive current to about 1.4 mA. Where high-speed actuation is desireable, use a lower value resistor for R1. An additional RC peaking circuit is not required with the LH1525 relay.

R2 is an optional pull-up resistor which pulls the logic level high ouput (V_{OH}) up toward the V_S potential. The pull-up resistance is set at a high value to minimize the overall current drawn from the V_S. The primary purpose of this resistor is to keep the differential voltage across the LED below its turn-on threshold. LED dropout voltage is graphed vs. temperature in the Typical Performance Characteristics section. When the logic gate is high, leakage current will flow through R_2. R_2 will draw up to 8 μA before developing a voltage potential which might possibly turn on the LED.

Many applications will operate satisfactorily without a pull-up resistor. In the logic circuit in Figure 1 the only path for current to flow is back into the logic gate. Logic leakage is usually negligible. Each application should be evaluated, however, over the full operating temperature range to make sure that leakage current through the input control LED is kept to a value less than the minimum LED forward current for switch turn-off specification.

Figure 1. Input Control Circuit