

### FEATURES

- Normally Open, Single Pole Single Throw Operation
- Control 350 VAC or DC Voltage
- Switch 150 mA Loads
- LED Control Current, 1 mA, Typical
- Low ON-Resistance, 20  $\Omega$  Typ. at 50 mA
- Isolation Test Voltage, 3750 VAC<sub>RMS</sub>
- Current Limit Protection
- Underwriters Lab File # E52744

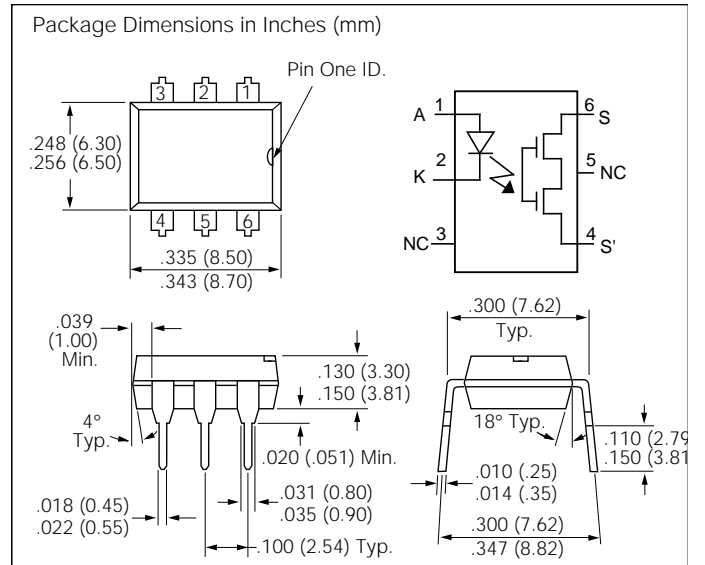
### APPLICATIONS

- Telephone Switch Hook
- High Voltage Test Equipment
- TRIAC Driver
- Motor Control
- Industrial Control Systems

### DESCRIPTION

The LH1540 is a single pole single throw (SPST), normally open (NO), solid state relay. The relay can control AC or DC loads currents up to 100 mA, with a supply voltage up to 350 V. The device is packaged in a six pin 0.3 inch dual-in line package. This package offers an insulation dielectric withstand of 3750 VAC<sub>RMS</sub>.

The coupler consists of a AlGaAs LED that is optically coupled to a dielectrically isolated photodiode array which drives two series connected high voltage MOS transistors. The typical ON-resistance is 20  $\Omega$  at 25 mA and is linear up to 50 mA. There is built-in current limiting circuitry in the detector chip, enabling it to pass FCC 68-302 and other regulatory voltage surge requirements when over voltage protection is provided.



### Absolute Maximum Ratings (T<sub>A</sub>=25°C)

#### Emitter

Reverse Voltage.....	6.0 V
Continuous Forward Current .....	60 mA
Peak Forward Current (1 $\mu$ s) .....	1 A
Power Dissipation .....	100 mW
Derate Linearly from 25°C .....	1.3 mW/°C

#### Detector

Output Breakdown Voltage.....	350 V
Continuous Load Current .....	150 mA
Total Power Dissipation.....	400 mW
Derate Linearly from 25°C .....	See Figure 3

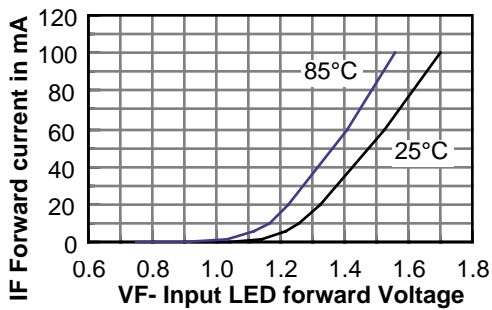
#### Package

Isolation Test Voltage .....	3750 VAC <sub>RMS</sub>
Isolation Resistance	
V <sub>IO</sub> =500 V, T <sub>A</sub> =25°C .....	$\geq 10^{12} \Omega$
V <sub>IO</sub> =500 V, T <sub>A</sub> =100°C .....	$\geq 10^{11} \Omega$
Power Dissipation .....	500 mW
Derate Linearly from 25°C .....	2.5 mW/°C
Storage Temperature Range .....	-40 to +150°C
Operating Temperature Range.....	-40 to +85°C
Junction Temperature .....	100°C
Soldering Temperature, 2 mm from case, 10 sec. ....	260°C

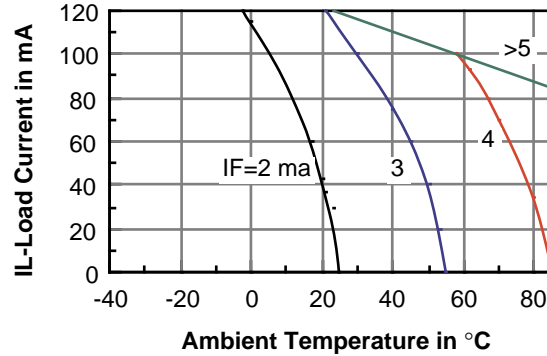
**Characteristics (T<sub>A</sub>=25°C)**

Description	Symbol	Min.	Typ.	Max.	Unit	Test Condition
<b>Emitter</b>						
Forward Voltage	V <sub>F</sub>		1.25	1.5	V	I <sub>F</sub> =10 mA
V <sub>F</sub> Temperature Coefficient	ΔV <sub>F</sub> /ΔT		-2.2		mV/°C	
Reverse Current	I <sub>R</sub>		1	10	μA	V <sub>R</sub> =6 V
Junction Capacitance	C <sub>J</sub>		15		pF	V <sub>F</sub> =0 V, f=1 MHz
Dynamic Resistance	ΔV <sub>F</sub> /ΔI <sub>F</sub>		6		W	I <sub>F</sub> =10 mA
Switching Time	t <sub>R</sub> , t <sub>F</sub>		1		μs	I <sub>F</sub> =10 mA
<b>Detector</b>						
Output Breakdown Voltage	V <sub>B</sub>	350			V	I <sub>B</sub> =50 μA
Output Off-State Leakage Current	I <sub>T(OFF)</sub>		.02	200	nA	V <sub>T</sub> =±100 V, I <sub>F</sub> =0 mA
Feed through Capacitance, pins 4 to 6	C <sub>T</sub>		55		pF	I <sub>F</sub> =0, f=1 KHz, V <sub>L</sub> =1 VP-P
Current Limit	I <sub>LMT</sub>	170	210	250	mA	I <sub>F</sub> =5 mA, t=5 ms
<b>Package</b>						
LED Forward Current for Turn-on	I <sub>FTh</sub>		1	2	mA	I <sub>L</sub> =100 mA, t=10 ms
LED Forward Current for Turn-off	I <sub>FOFF</sub>		0.2	0.9	mA	V <sub>L</sub> =±300 V, I <sub>L</sub> <5 μA
ON-resistance	R <sub>ON</sub>	12	20	25	W	I <sub>F</sub> =5 mA, I <sub>L</sub> =50 mA
Turn-on Time	t <sub>ON</sub>		1.2	2.0	ms	I <sub>F</sub> =5 mA, V <sub>L</sub> =+50 V
Turn-off Time	t <sub>OFF</sub>		0.5	2.0	ms	R <sub>L</sub> =1 kΩ

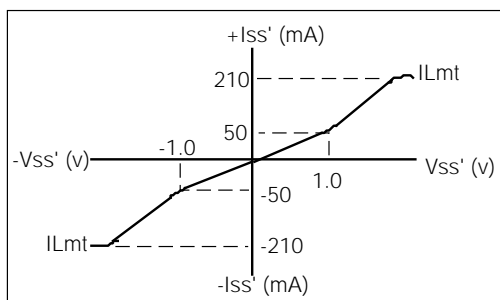
**Figure 1. LED forward current vs. forward voltage**



**Figure 3. Recommended load current vs. temp.**



**Figure 2. Forward current vs. forward voltage**



**Figure 4. Current limit vs. temperature**

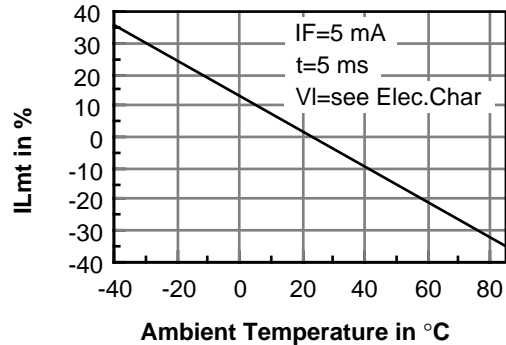


Figure 5. Minimum IRT required vs. temp.

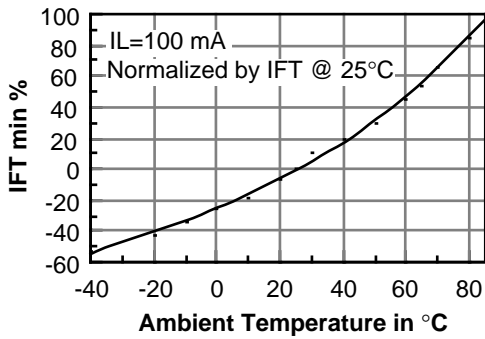


Figure 6. Change in ON-resistance vs. temperature

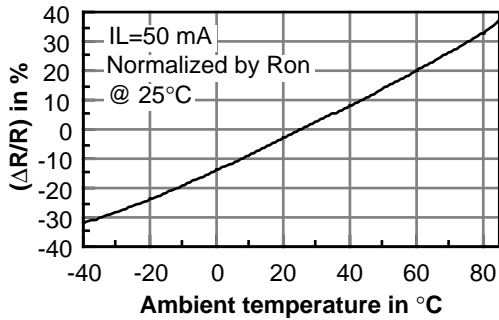


Figure 7. Change in ON-resistance vs. LED current

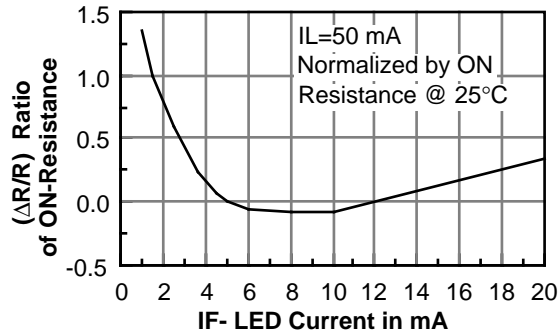


Figure 8. Turn on time vs. LED current and temp.

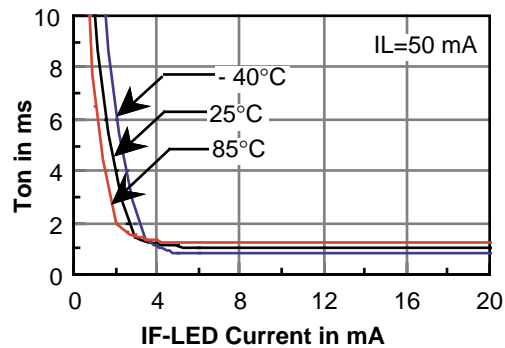


Figure 9.  $t_{OFF}$  vs. LED current and temperature

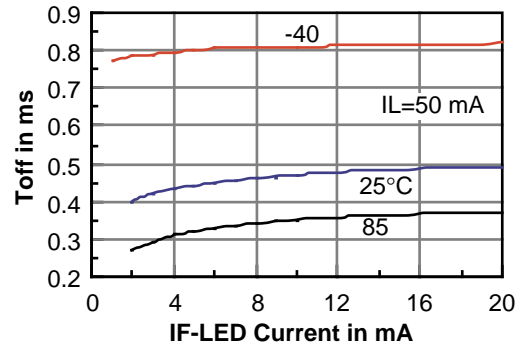


Figure 10. Change in  $t_{ON}$  vs. temperature

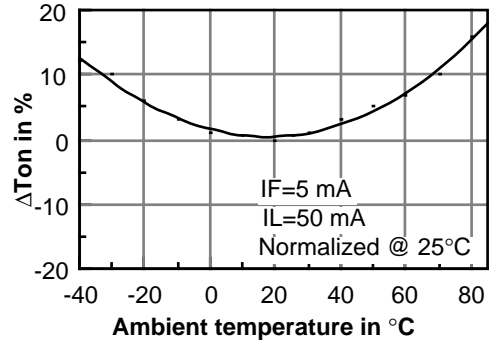


Figure 11. Change in  $t_{OFF}$  vs. temperature

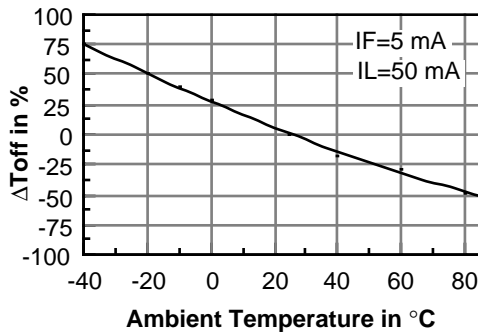


Figure 12. Timing test circuit and timing waveform

