

SIEMENS

LH1540 HIGH VOLTAGE, SOLID STATE RELAY OPTOCOUPLER

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 Ω Typ. at 50 mA
- Isolation Test Voltage, 3750 VAC_{RMS}
- Current Limit Protection
- Underwriters Lab File # E52744

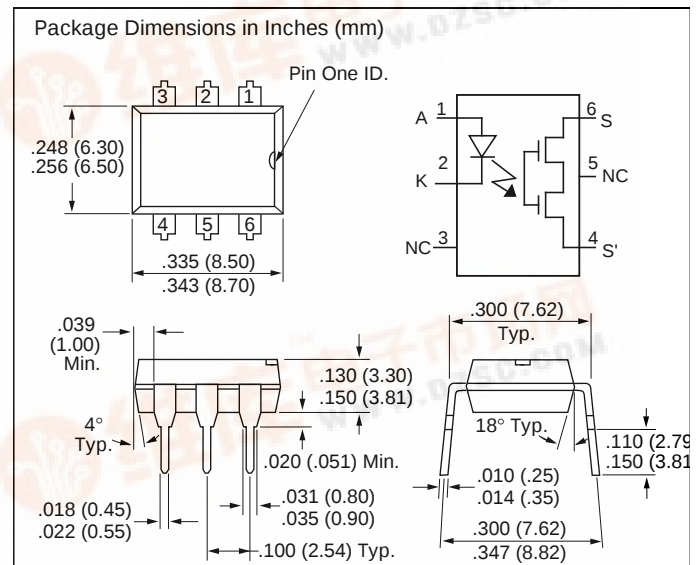
APPLICATIONS

- 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_{RMS}.

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 Ω 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 ($T_A=25^\circ\text{C}$)

Emitter

Reverse Voltage.....	6.0 V
Continuous Forward Current	60 mA
Peak Forward Current (1 μs)	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 _{RMS}
Isolation Resistance	
$V_{IO}=500\text{ V}$, $T_A=25^\circ\text{C}$	$\geq 10^{12}\ \Omega$
$V_{IO}=500\text{ V}$, $T_A=100^\circ\text{C}$	$\geq 10^{11}\ \Omega$
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_A=25°C)

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

Figure 1. LED forward current vs. forward voltage

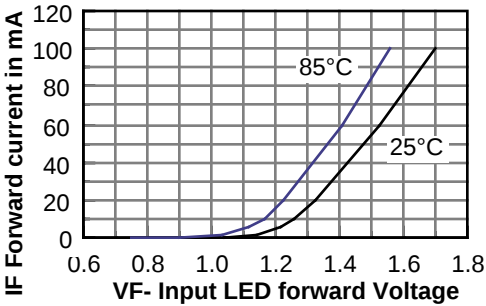


Figure 3. Recommended load current vs. temp.

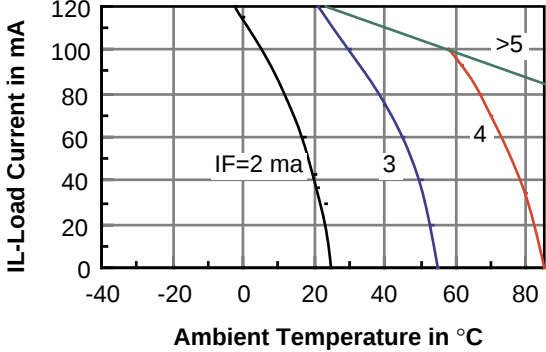


Figure 2. Forward current vs. forward voltage

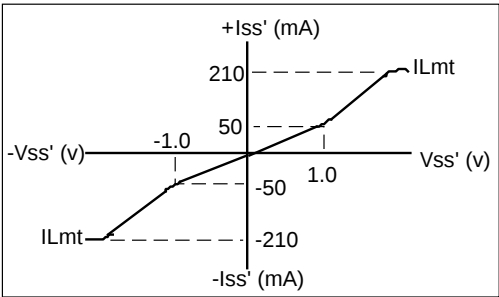


Figure 4. Current limit vs. temperature

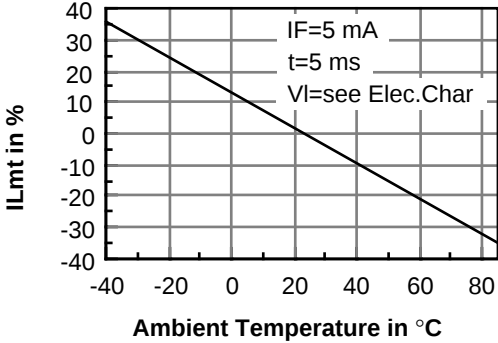


Figure 5. Minimum IRT required vs. temp.

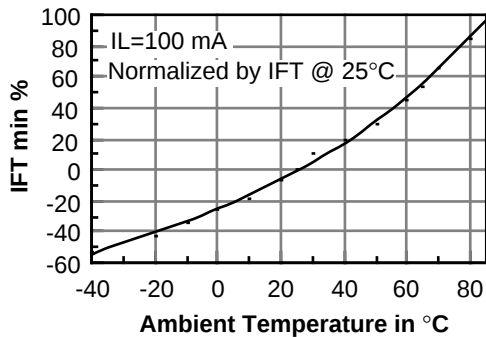


Figure 6. Change in ON-resistance vs. temperature

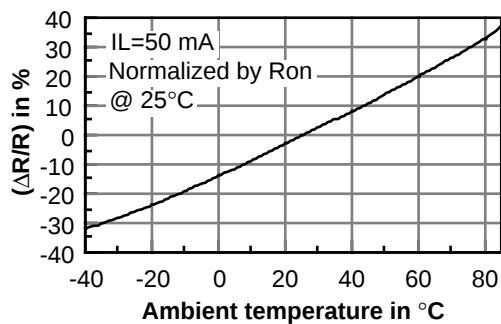


Figure 7. Change in ON-resistance vs. LED current

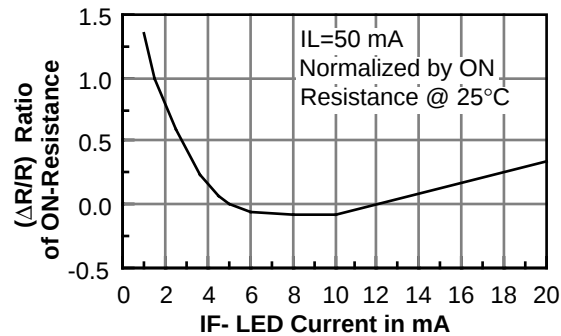


Figure 8. Turn on time vs. LED current and temp.

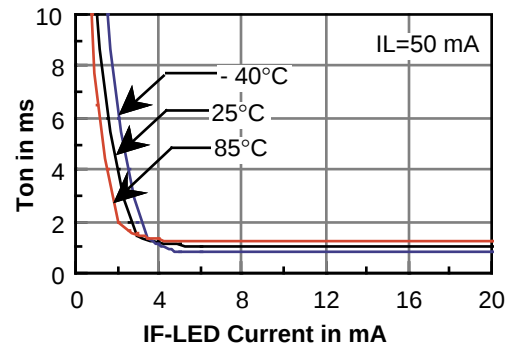


Figure 9. t_{OFF} vs. LED current and temperature

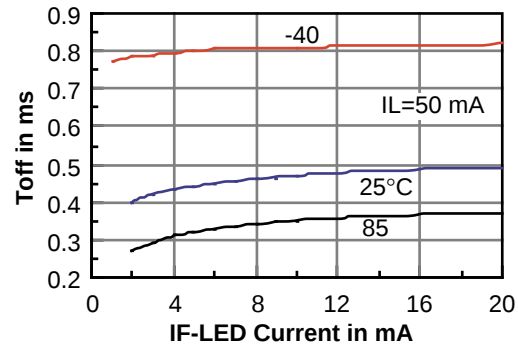


Figure 10. Change in t_{ON} vs. temperature

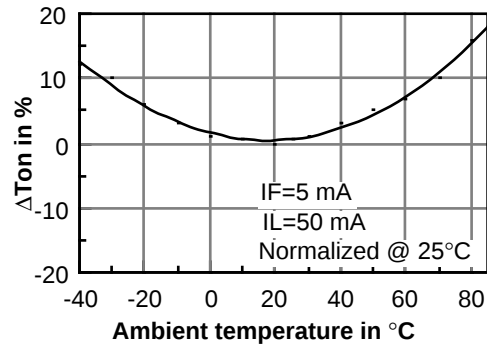


Figure 11. Change in t_{OFF} vs. temperature

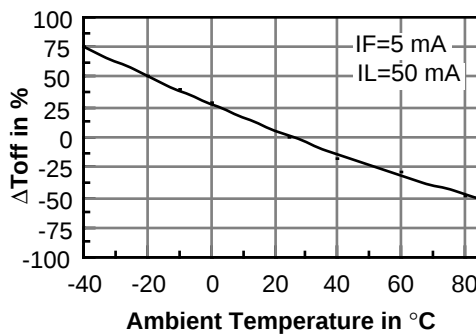


Figure 12. Timing test circuit and timing waveform

