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**

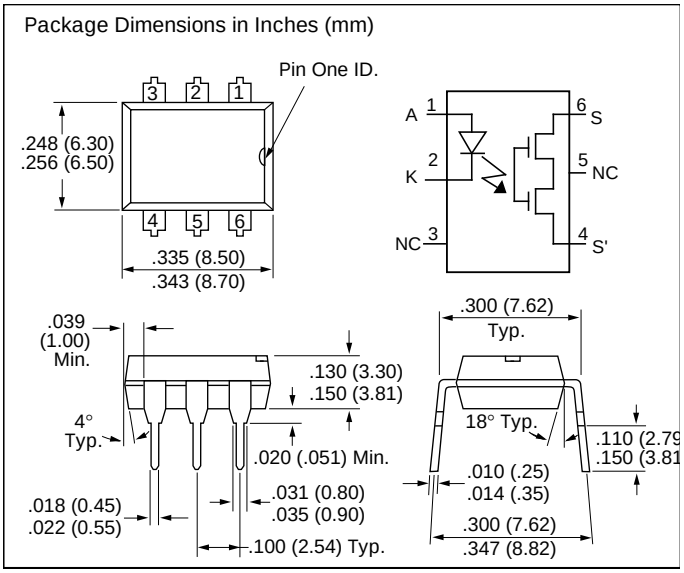
APPLICATIONS

- **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°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
Continous 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 V, T_A=25°C ..... $\geq 10^{12}$ Ω
V_{IO}=500 V, T_A=100°C ..... $\geq 10^{11}$ Ω
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	$\Delta V_F/\Delta T$		–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	$\Delta V_F/\Delta I_F$		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

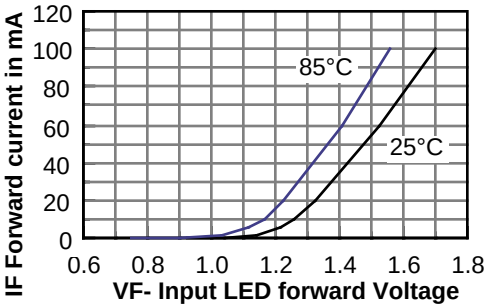


Figure 2. Forward current vs. forward voltage

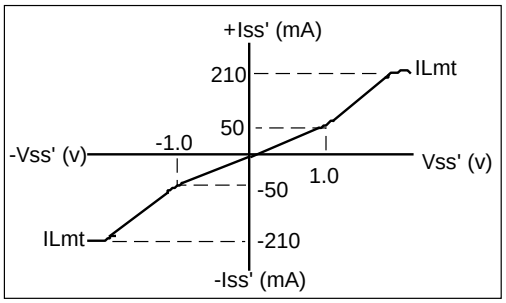


Figure 3. Recommended load current vs. temp.

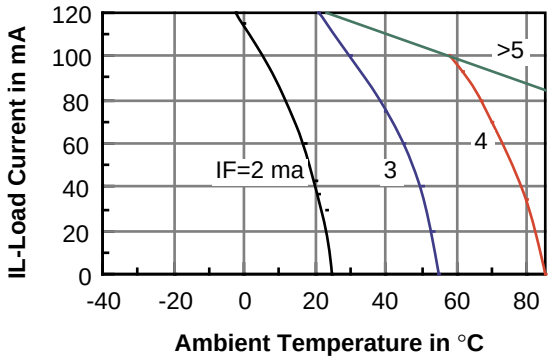


Figure 4. Current limit vs. temperature

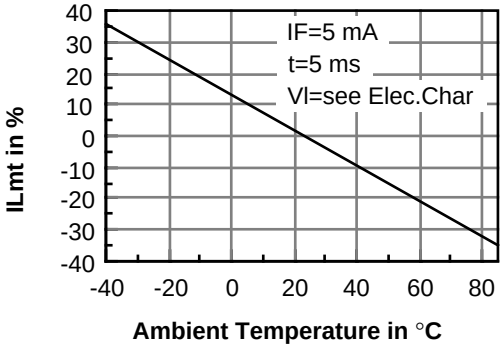


Figure 5. Minimum IRT required vs. temp.

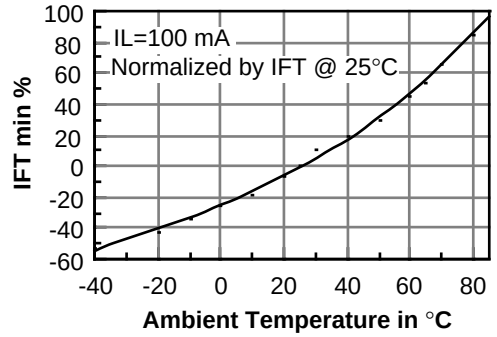


Figure 6. Change in ON-resistance vs. temperature

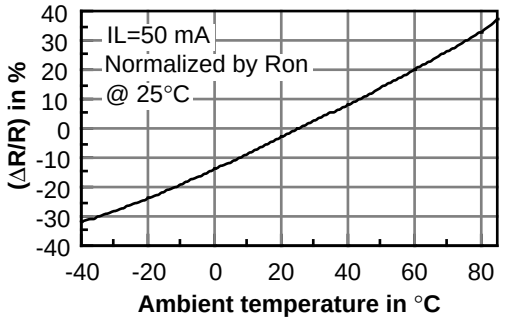


Figure 7. Change in ON-resistance vs. LED current

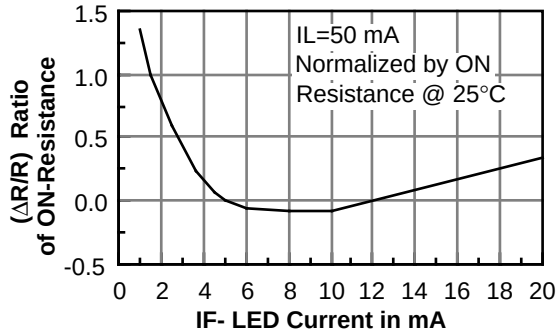


Figure 8. Turn on time vs. LED current and temp.

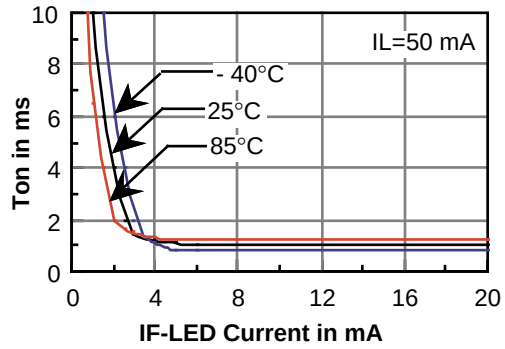


Figure 9. t_{OFF} vs. LED current and temperature

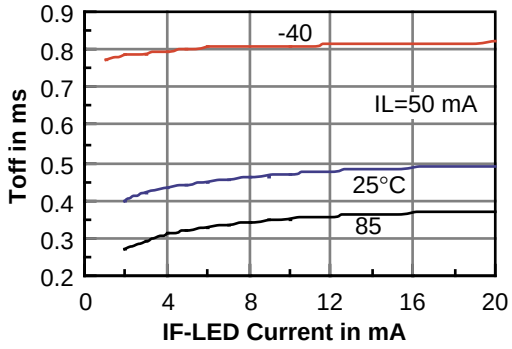


Figure 10. Change in t_{ON} vs. temperature

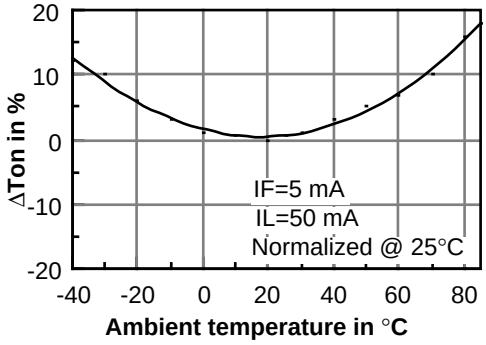


Figure 11. Change in t_{OFF} vs. temperature

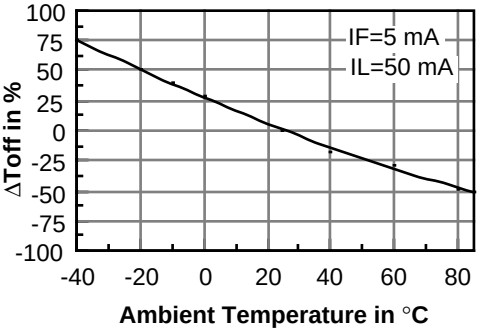


Figure 12. Timing test circuit and timing waveform