



## Dual 1 Form A Solid State Relay (Low Capacitance)

### FEATURES

- Dual Channel, LH1541 Type
- Low Capacitance Switch (5.0 pF)
- I/O Isolation, 5300 V<sub>RMS</sub>
- Extremely High OFF-resistance (100 T $\Omega$ )
- Load Voltage 350 V
- Linear, AC/DC Operation
- Clean Bounce Free Switching
- Low Power Consumption
- High Reliability Monolithic Receptor

### AGENCY APPROVALS

- UL – File No. E52744
- CSA – Certification 093751
- BSI/BABT Cert. No. 7980
- VDE 0884 Approval
- FIMKO Approval

### APPLICATIONS

- Instrumentation
  - Thermocouple Switching
  - Analog Multiplexing
- Reed Relay Replacement
- Programmable Logic Controllers
- Data Acquisition
- Test Equipment

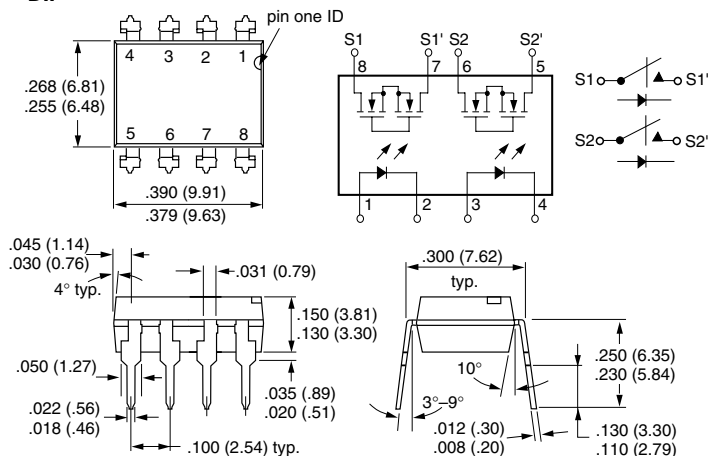
### DESCRIPTION

These dual SSRs (LH1544, Dual 1 Form A) are SPST normally open switches which can replace electromechanical relays in many applications. The relays provide a low-capacitance, high-voltage switch contact with high off-resistance and low switch-offset voltage. These characteristics, combined with high-speed actuation, result in an SSR which is ideal for small signal and dc instrumentation applications.

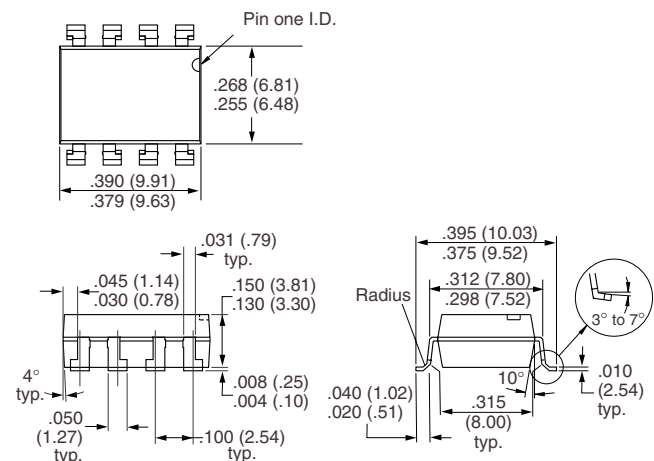
The relays are constructed by using a GaAlAs LED for actuation control and an integrated monolithic die for the switch output. The die is comprised of a photodiode array, switch-control circuitry, and low-capacitance MOS-FET switches.

Package Dimensions in Inches (mm)

#### DIP



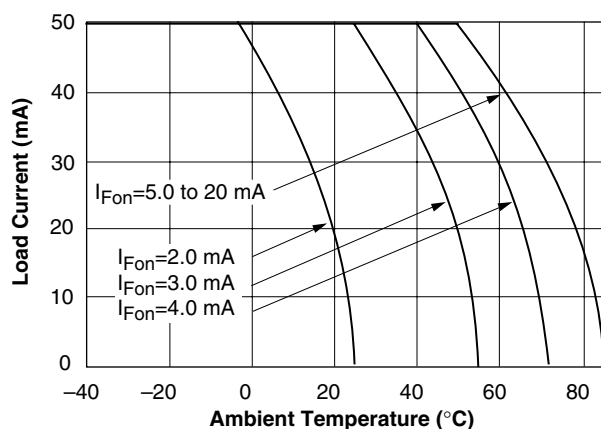
#### SMD



### Part Identification

| Part Number | Description                        |
|-------------|------------------------------------|
| LH1544AB    | 8-pin DIP, Tubes                   |
| LH1544AAC   | 8-pin SMD, Gullwing, Tubes         |
| LH1544AACTR | 8-pin SMD, Gullwing, 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 this document. Exposure to absolute Maximum Ratings for extended periods of time can adversely affect reliability.

|                                                                                             |       |                |
|---------------------------------------------------------------------------------------------|-------|----------------|
| Ambient 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 Voltage<br>( $t=1.0$ s, $I_{SO}=10$ $\mu\text{A}$ max) ( $V_{ISO}$ ) | ..... | 5300 $V_{RMS}$ |
| Pole-to-Pole Isolation Voltage (S1 to S2)*<br>(dry air, dust free, at sea level)            | ..... | 1600 V         |
| LED Continuous Forward Current ( $I_F$ )                                                    | ..... | 50 mA          |
| LED Reverse Voltage ( $I_R \leq 10$ $\mu\text{A}$ ) ( $V_R$ )                               | ..... | 8.0 V          |
| DC or Peak AC Load Voltage ( $I_L \leq 50$ $\mu\text{A}$ ) ( $V_L$ )                        | ..... | 200 V          |
| Continuous DC Load Current ( $I_L$ )                                                        | ..... |                |
| One Pole Operating                                                                          | ..... | 55 mA          |
| Two Poles Operating                                                                         | ..... | 40 mA          |
| Peak Load Current ( $t=100$ ms) (single shot) ( $I_P$ )                                     | ..... | 100 mA         |
| Output Power Dissipation (continuous) ( $P_{DISS}$ )                                        | ..... | 600 mW         |

\* Breakdown occurs between the output pins external to the package.

## 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                            | Sym.       | Min.  | Typ.  | Max.  | Units         | Test Conditions             |
|--------------------------------------|------------|-------|-------|-------|---------------|-----------------------------|
| <b>Input</b>                         |            |       |       |       |               |                             |
| LED Forward Current, Switch Turn-on  | $I_{Fon}$  | —     | 0.9   | 2.0   | mA            | $I_L=100$ mA, $t=10$ ms     |
| LED Forward Current, Switch Turn-off | $I_{Foff}$ | 0.2   | 0.8   | —     | mA            | $V_L \pm 150$ V             |
| LED Forward Voltage                  | $V_F$      | 1.10* | 1.19* | 1.45* | V             | $I_F=10$ mA                 |
| <b>Output</b>                        |            |       |       |       |               |                             |
| ON-resistance                        | $R_{ON}$   | 70    | 110   | 160   | $\Omega$      | $I_F=5.0$ mA, $I_L=50$ mA   |
| OFF-resistance                       | $R_{OFF}$  | 0.5   | 10000 | —     | G $\Omega$    | $I_F=0$ mA, $V_L=\pm 100$ V |
| Off-state Leakage Current            | —          | —     | 0.01  | 200   | nA            | $I_F=0$ mA, $V_L=\pm 100$ V |
|                                      |            | —     | —     | 1.0   | $\mu\text{A}$ | $I_F=0$ mA, $V_L=\pm 200$ V |
| Output Capacitance                   | —          | —     | 0     | —     | pF            | $I_F=0$ mA, $V_L=1.0$ V     |
|                                      |            | —     | 0.5   | —     | pF            | $I_F=0$ mA, $V_L=50$ V      |
| Pole-to-Pole Capacitance (S1 to S2)  | —          | —     | 0.5   | —     | pF            | $I_F=5.0$ mA                |
| Switch Offset                        | —          | —     | 0.1   | —     | V             | $I_F=5.0$ mA                |
| <b>Transfer</b>                      |            |       |       |       |               |                             |
| Input/Output Capacitance             | $C_{ISO}$  | —     | 1.1   | —     | pF            | $V_{ISO}=1.0$ V             |
| Turn-on Time                         | $t_{on}$   | —     | 0.13† | 0.25† | ms            | $I_F=5.0$ mA, $I_L=50$ mA   |
| Turn-off Time                        | $t_{off}$  | —     | 0.06† | 0.25† | ms            | $I_F=5.0$ mA, $I_L=50$ mA   |

\*  $I_F=5.0$  mA †  $I_L=12.5$  mA

The following information refers to the SSR Recommended Operation Conditions on the previous page.

- Both relays on with equal load currents. For single relay operation, refer to the LH1530 Recommended Operating Conditions graph.
- Both relays on with equal load currents. For single relay operation, refer to the LH1540 Recommended Operating Conditions graph.
- Single relay operation.

Typical Performance Characteristics

Figure 1. LED Voltage vs. Temperature

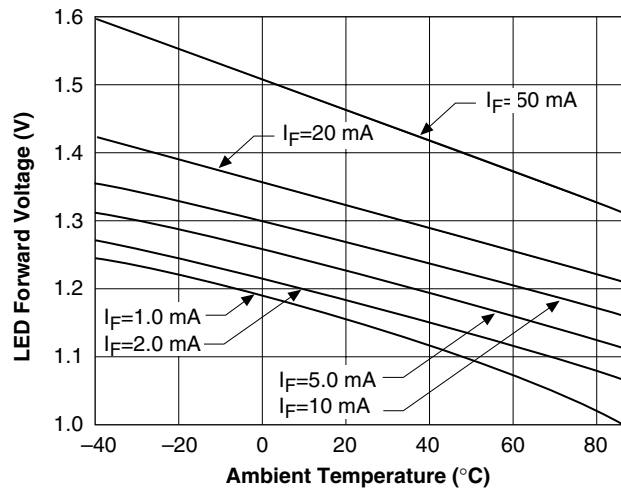


Figure 4. ON-Resistance vs. Temperature

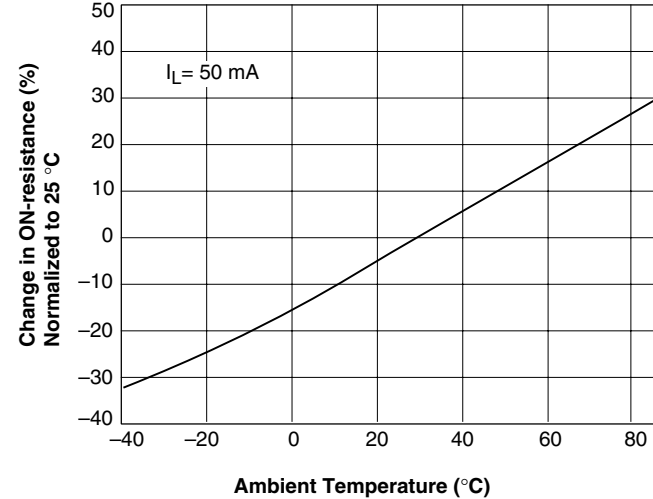


Figure 2. LED Dropout Voltage vs. Temperature

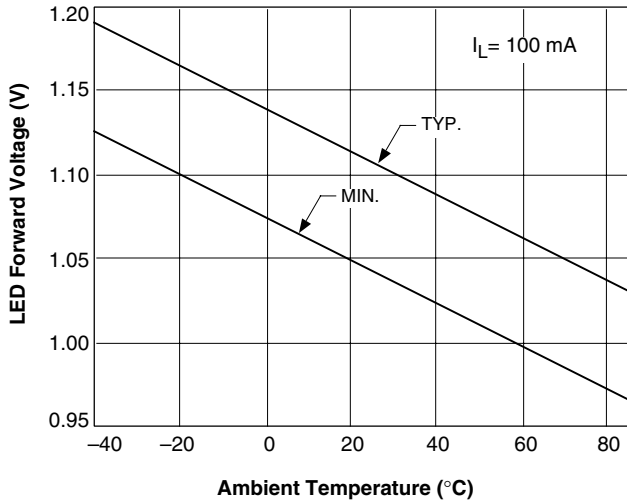


Figure 5. Switch Capacitance vs. Applied Voltage

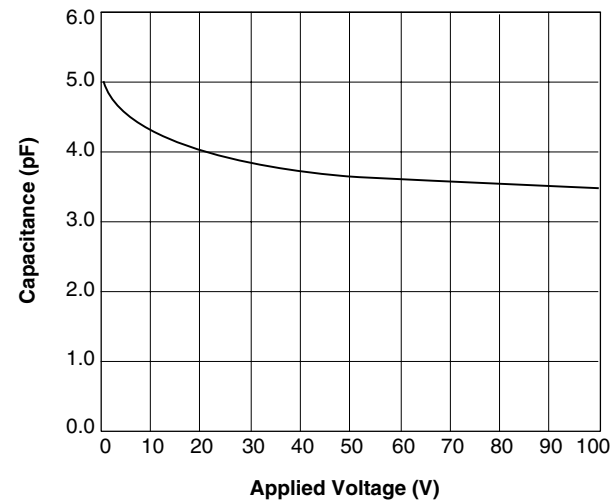


Figure 3. LED Current for Switch Turn-On vs. Temperature

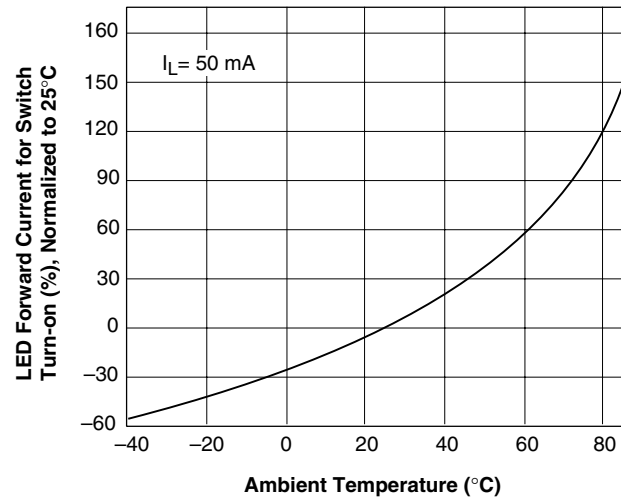


Figure 6. Insertion Loss vs. Frequency

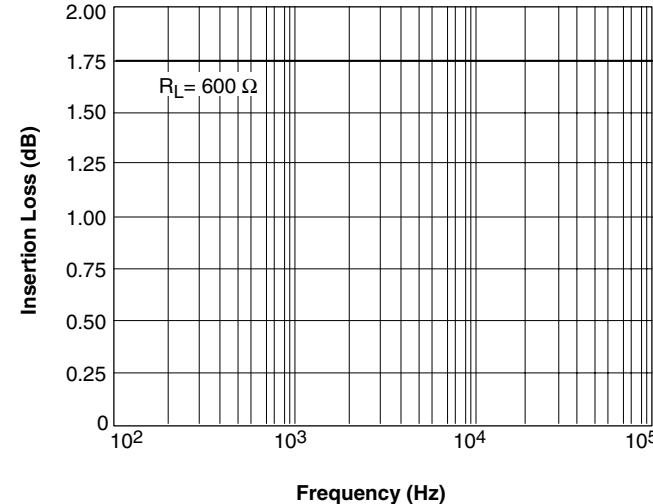


Figure 7. Output Isolation

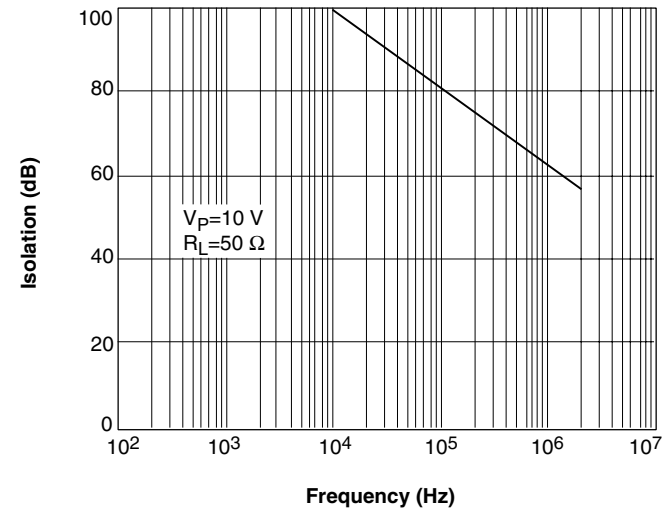


Figure 10. Switch Breakdown Voltage vs. Temperature

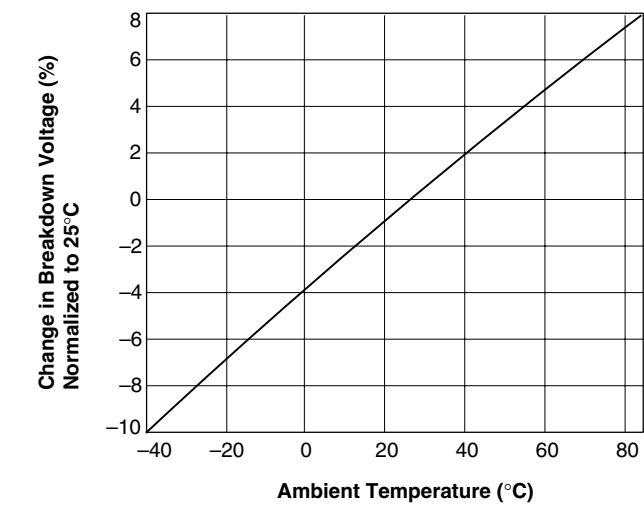


Figure 8. Leakage Current vs. Applied Voltage

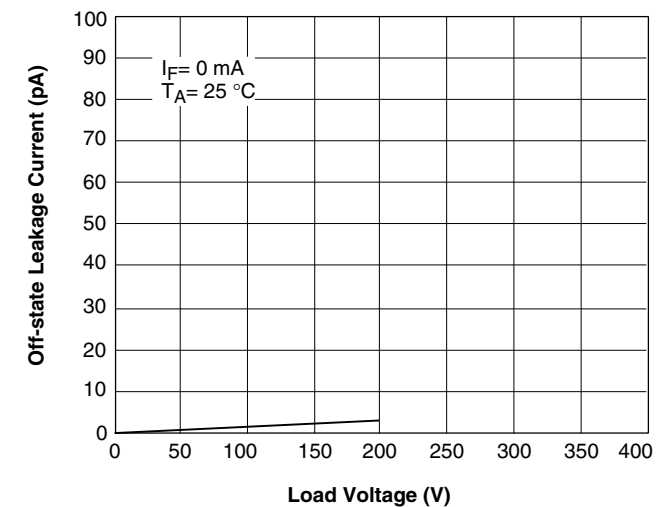


Figure 11. Switch Offset Voltage vs. Temperature

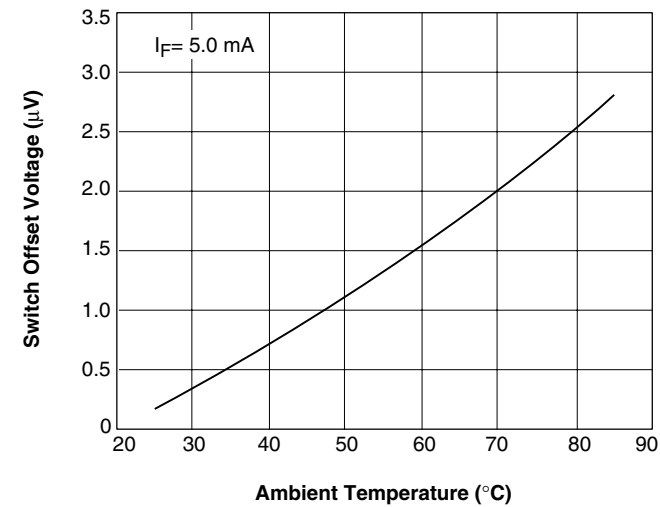


Figure 9. Leakage Current vs. Applied Voltage at Elevated Temperatures

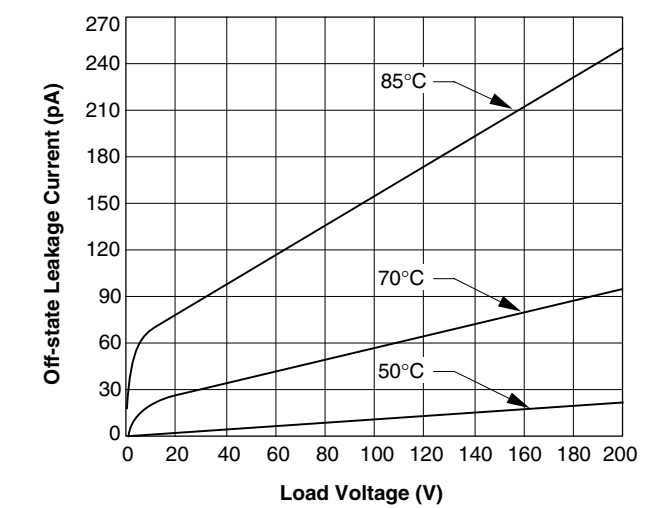


Figure 12. Switch Offset Voltage vs. LED Current

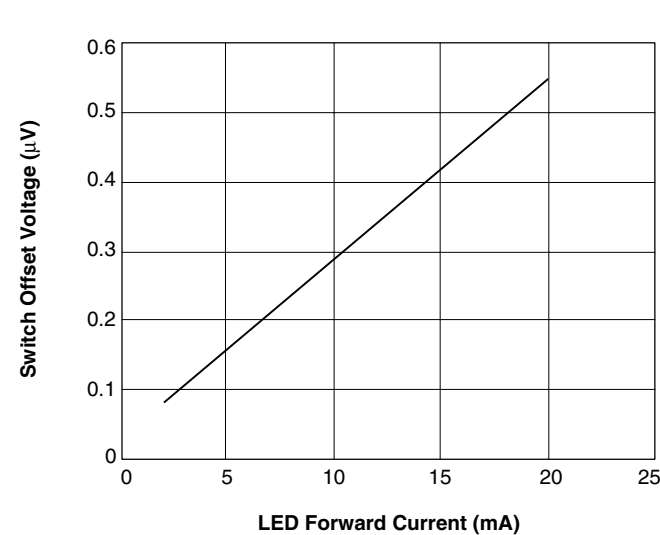


Figure 13. Turn-On Time vs. Temperature

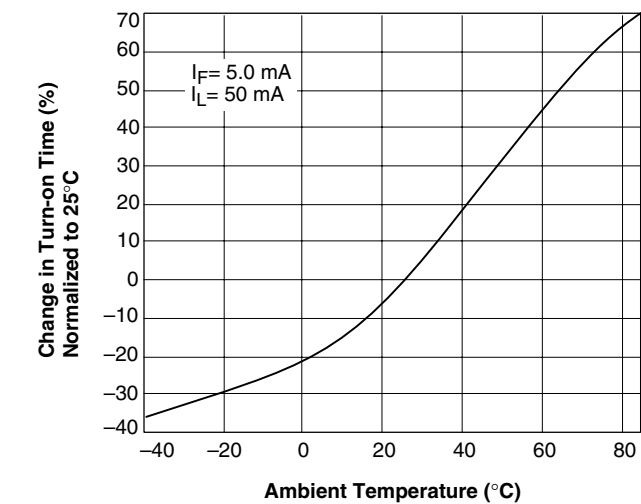


Figure 16. Turn-On Time vs. LED Current

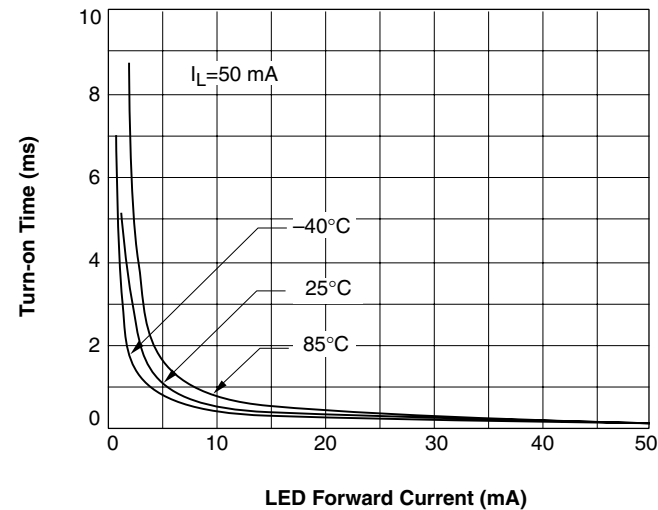


Figure 14. Turn-Off Time vs. Temperature

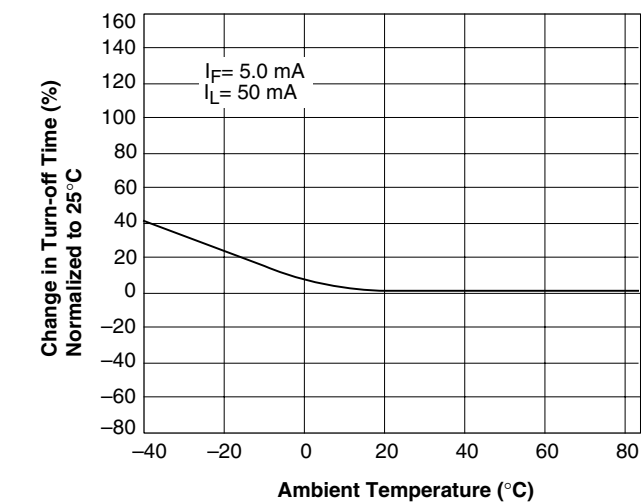


Figure 17. Turn-Off Time vs. LED Current

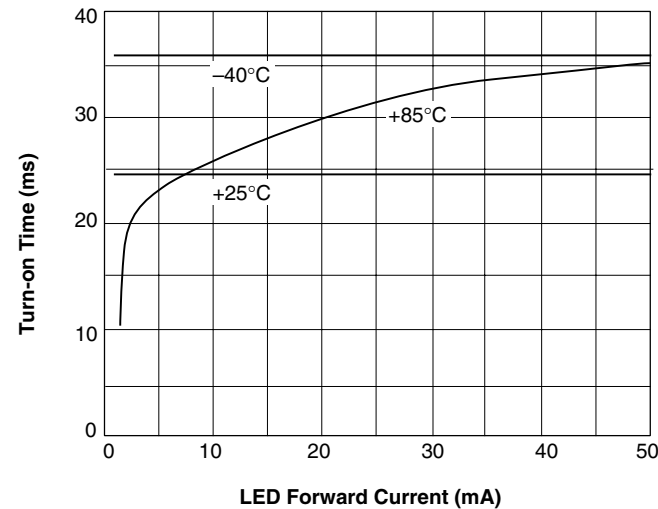


Figure 15. Turn-On Time vs. LED Current

