



# LH1505AB/AAC/AACTR

## Dual 1 Form A Solid State Relay

### FEATURES

- Two Independent Relays
- Current Limit Protection
- I/O Isolation, 5300 V<sub>RMS</sub>
- Typical R<sub>ON</sub> 15 Ω
- Load Voltage 350 V
- Load Current 120 mA
- High Surge Capability
- Linear, AC/DC Operation
- Clean Bounce Free Switching
- Low Power Consumption
- High Reliability Monolithic Receptor
- SMD Lead Available on Tape and Reel

### AGENCY APPROVALS

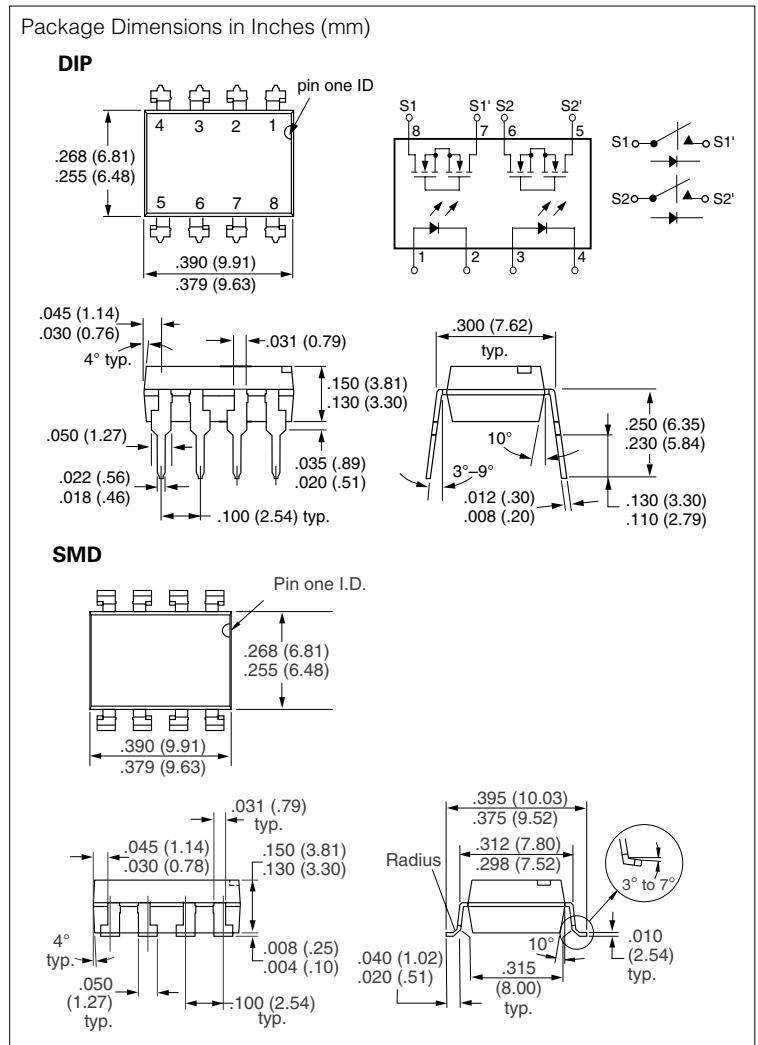
- UL – File No. E52744
- CSA – Certification 093751
- BSI/BABT Cert. No. 7980
- VDE 0884 Approval
- FIMKO Approval

### APPLICATIONS

- General Telecom Switching
  - On/off Hook Control
  - Ring Delay
  - Dial Pulse
  - Ground Start
  - Ground Fault Protection
- Instrumentation
- Industrial Controls

### DESCRIPTION

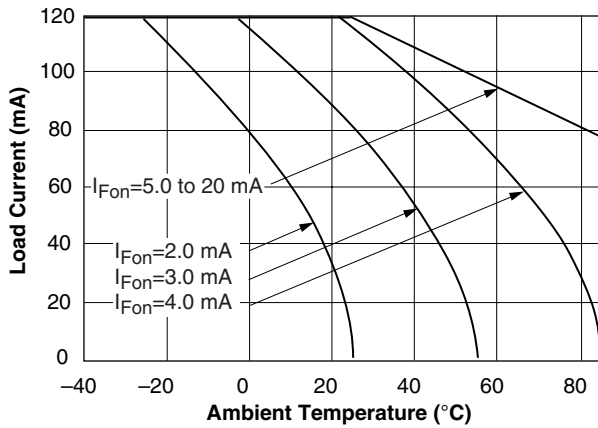
The LH1505 contains two normally open switches that can be used as two independent SPST relays or as one DPST relay. The relay is constructed using a GaAlAs LED for actuation control and integrated monolithic dies for the switch outputs. The die, fabricated in a high-voltage dielectrically isolated technology, is comprised of a photodiode array, switch control circuitry, and DMOS switches. In addition, the LH1505 relay employs current-limiting circuitry, enabling it to pass FCC 68.302 and other regulatory voltage surge requirements when over-voltage protection is provided.



### Part Identification

Part Number	Description
LH1505AB	8-pin DIP, Tubes
LH1505AAC	8-pin SMD, Gullwing, Tubes
LH1505AACTR	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 the data sheet. Exposure to maximum rating conditions for extended periods can adversely affect device 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  
( $t=1.0$  s,  $I_{ISO}=10$   $\mu\text{A}$  max) ( $V_{ISO}$ ) ..... 5300  $V_{RMS}$
- Pole-to-Pole Isolation Voltage (S1 to S2)\*  
(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 ( $I_L \leq 50$   $\mu\text{A}$ ) ( $V_L$ ) ..... 250 V
- Continuous DC Load Current ( $I_L$ )
  - One Pole Operating ..... 130 mA
  - Two Poles Operating ..... 120 mA
- Peak Load Current ( $t=100$  ms) (single shot) ( $I_P$ ) ..... †
- Output Power Dissipation (continuous) ( $P_{DISS}$ ) ..... 600 mW

\* Breakdown occurs between the output pins external to the package.  
 † Refer to Current Limit Performance Application Note for a discussion on relay operation during transient currents.

### 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	$I_{Fon}$	—	1.0	2.0	mA	$I_L=100$ mA, $t=10$ ms
LED Forward Current, Switch Turn-off	$I_{Foff}$	0.2	0.9	—	mA	$V_L \pm 200$ V
LED Forward Voltage	$V_F$	1.15	1.26	1.45	V	$I_F=10$ mA
<b>Output</b>						
ON-resistance	$R_{ON}$	10	15	20	$\Omega$	$I_F=5.0$ mA, $I_L=50$ mA
OFF-resistance	$R_{OFF}$	0.5	5000	—	G $\Omega$	$I_F=0$ mA, $V_L=\pm 100$ V
Current Limit	$I_{LMT}$	170	200	280	mA	$I_F=5.0$ mA, $t=5.0$ ms $V_L \pm 6.0$ V
Off-state Leakage Current	—	—	0.02	200	nA	$I_F=0$ mA, $V_L=\pm 100$ V
			—	1.0	$\mu\text{A}$	$I_F=0$ mA, $V_L=\pm 250$ V
Output Capacitance	—	—	55	—	pF	$I_F=0$ mA, $V_L=1.0$ V
			10	—	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	—	—	0.15	—	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	$t_{on}$	—	1.4*	4.0*	ms	$I_F=5.0$ mA, $I_L=50$ mA
Turn-off Time	$t_{off}$	—	0.7*	4.0*	ms	$I_F=5.0$ mA, $I_L=50$ mA

\*  $I_L=100$  mA

Typical Performance Characteristics

Figure 1. LED Voltage vs. Temperature

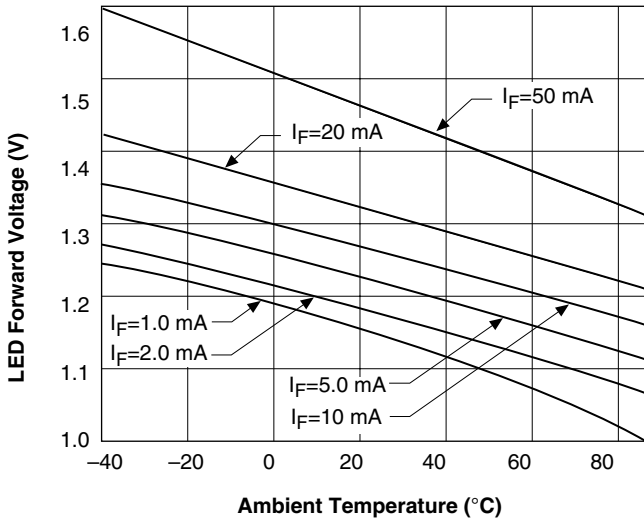


Figure 2. LED Current for Switch Turn-On vs. Temperature

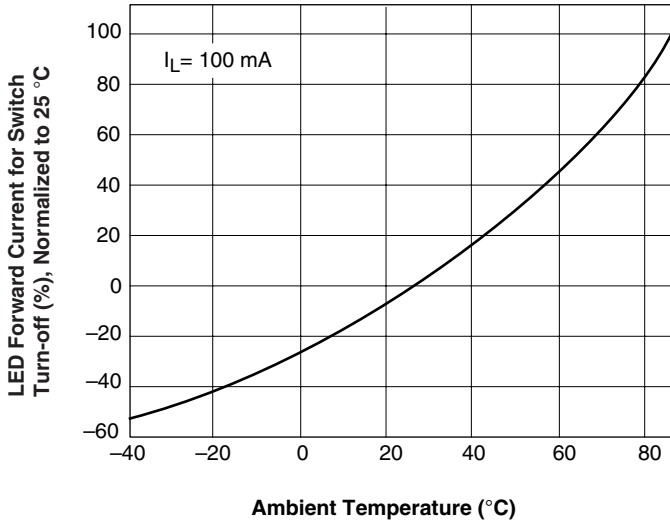


Figure 3. Current Limit vs. Temperature

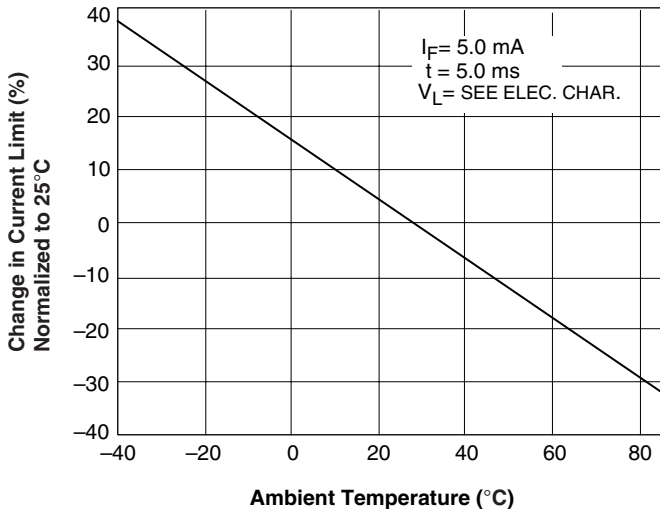


Figure 4. LED Dropout Voltage vs. Temperature

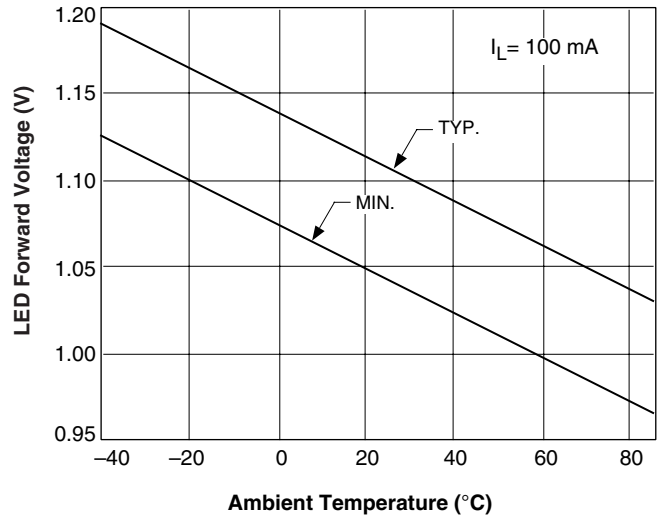


Figure 5. ON-Resistance vs. Temperature

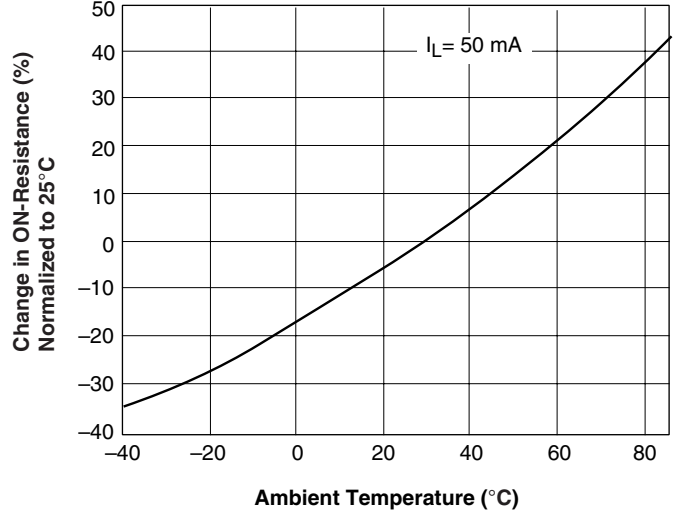
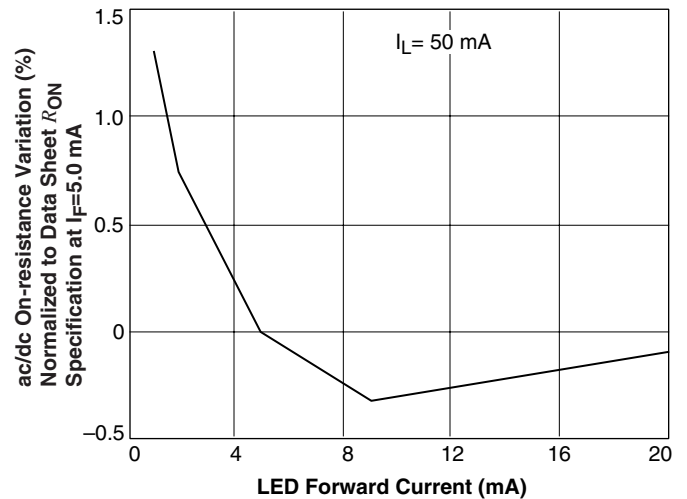
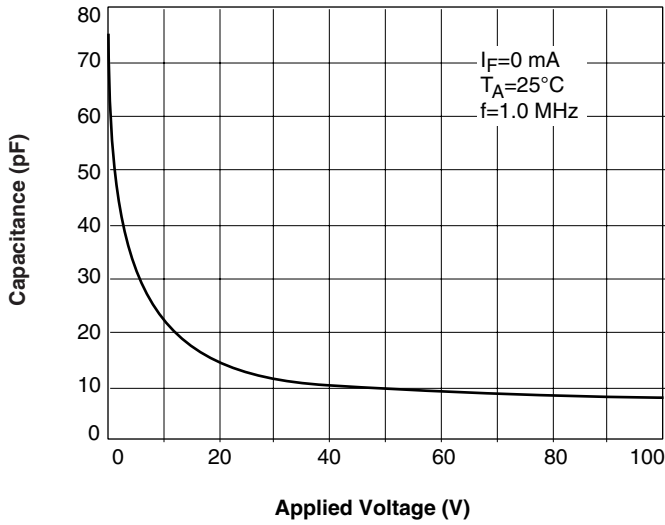


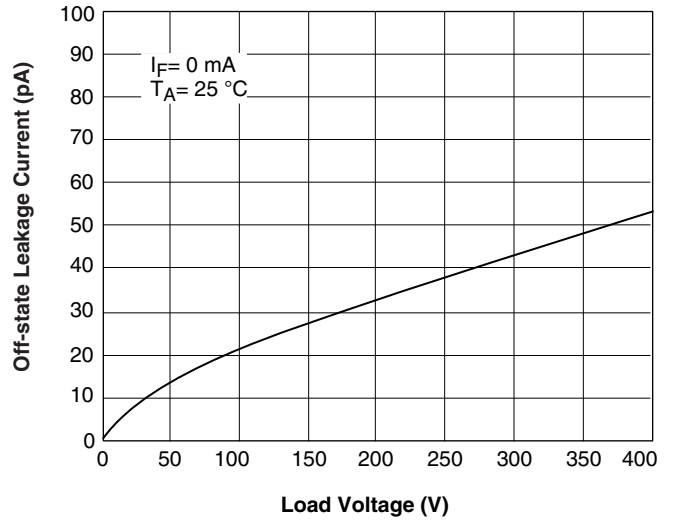
Figure 6. Variation in ON-Resistance vs. LED Current



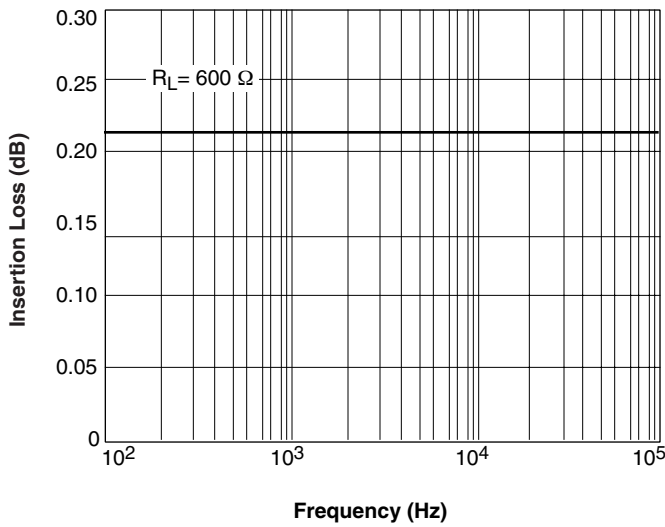
**Figure 7. Switch Capacitance vs. Applied Voltage**



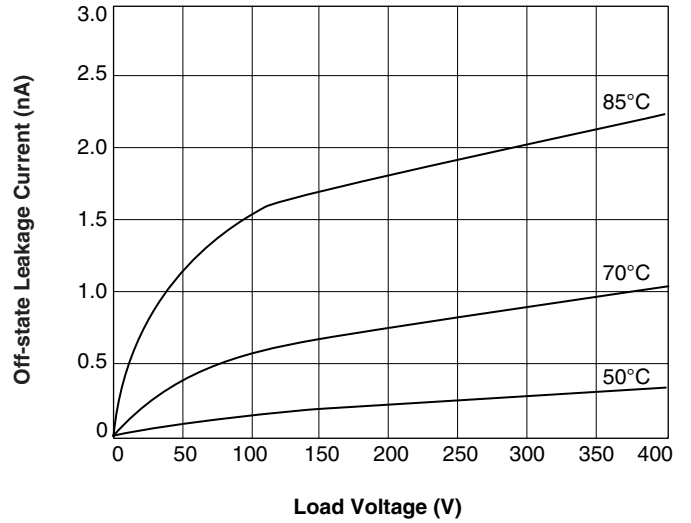
**Figure 10. Leakage Current vs. Applied Voltage**



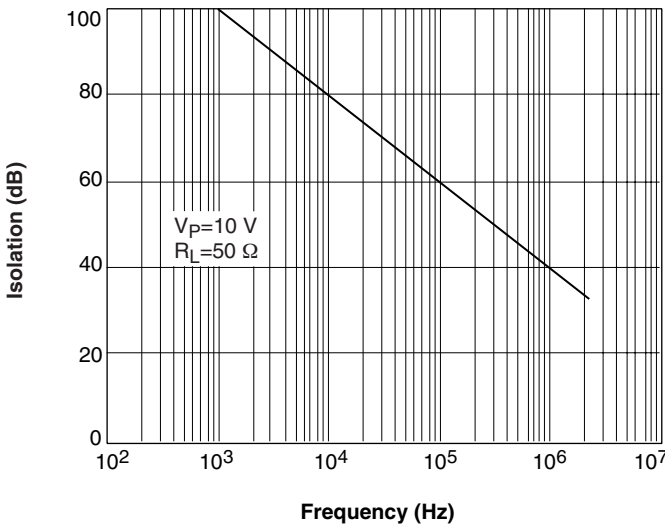
**Figure 8. Insertion Loss vs. Frequency**



**Figure 11. Leakage Current vs. Applied Voltage at Elevated Temperatures**



**Figure 9. Output Isolation**



**Figure 12. Switch Breakdown Voltage vs. Temperature**

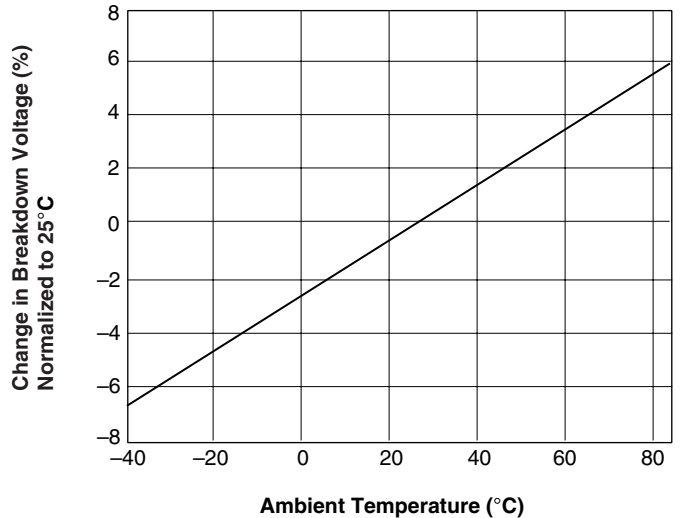


Figure 13. Switch Offset Voltage vs. Temperature

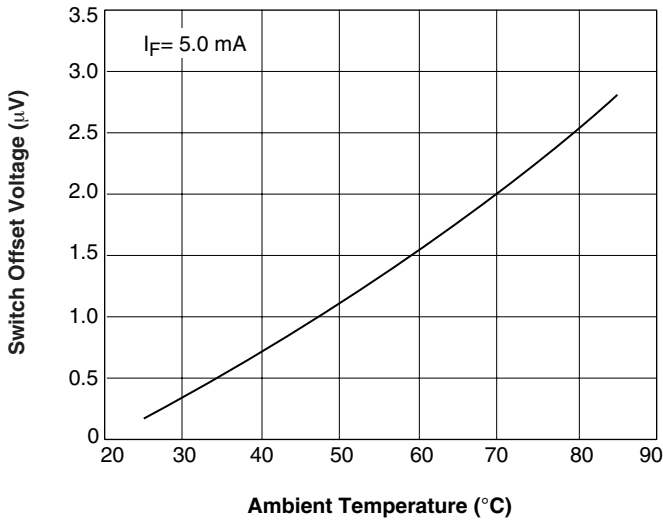


Figure 16. Turn-Off Time vs. Temperature

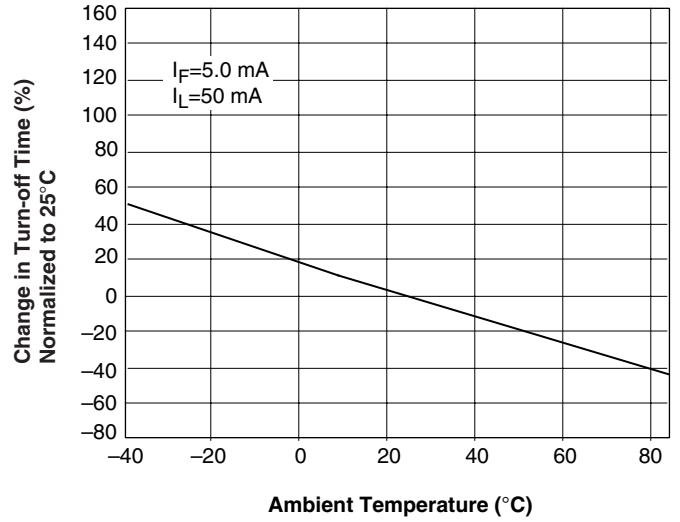


Figure 14. Switch Offset Voltage vs. LED Current

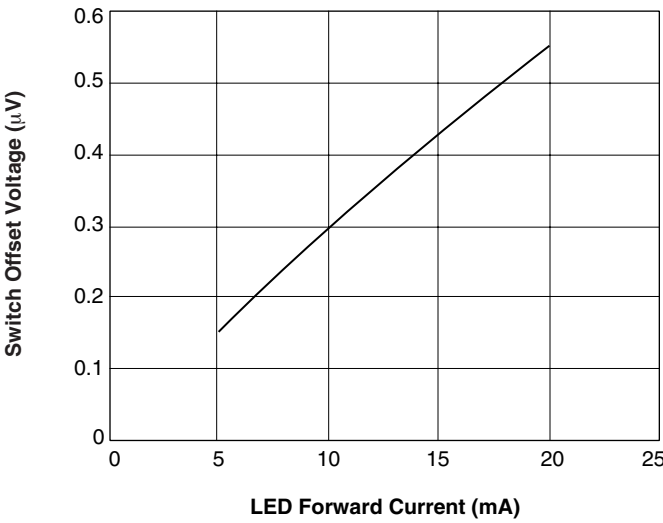


Figure 17. Turn-On Time vs. LED Current

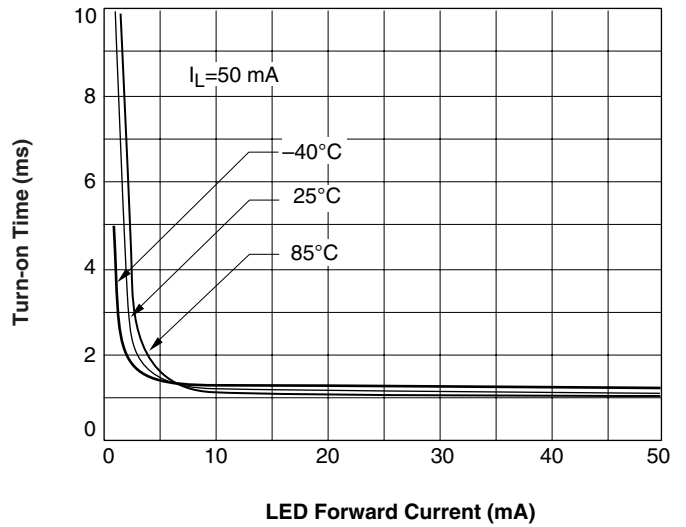


Figure 15. Turn-On Time vs. Temperature

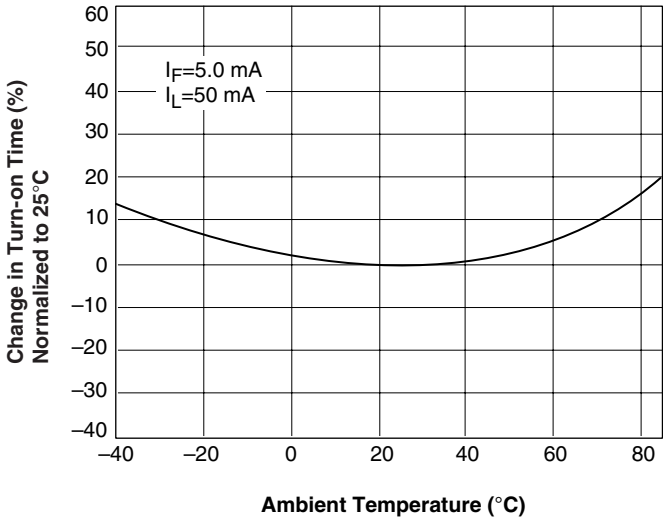


Figure 18. Turn-Off Time vs. LED Current

