LH1539AB/AAC/AACTR

1 Form A Photo Darlington Telecomswitch

FEATURES

- **Solid State Relay and Autopolarity Optocoupler in One 8-pin Package**
- **I/O Isolation, 5300 V_{RMS}**
- **Surface Mountable**
- **Optocoupler**
  - **Bidirectional Current Detection**
  - **High CTR: >300%**
- **Solid State Relay**
  - **Form A – LH1525 Type**
  - **Low Operating Current**
  - **Typical R_{ON}: 25 Ω**
  - **Load Voltage: 400 V**
  - **Load Current: 120 mA**
  - **Current-limit Protection**
  - **Linear, ac/dc Operation**
  - **Clean, Bounce-free Switching**
  - **Low Power Consumption**

AGENCY APPROVALS

- **UL – File No. E52744**
- **CSA – Certification 093751**
- **BSI/BABT Cert. No. 7980**

APPLICATIONS

- **General Telecom Switching**
  - **On/off-hook Switching**
  - **Dial Pulse**
  - **Ring Current Detection**
  - **Loop Current Sensing**

DESCRIPTION

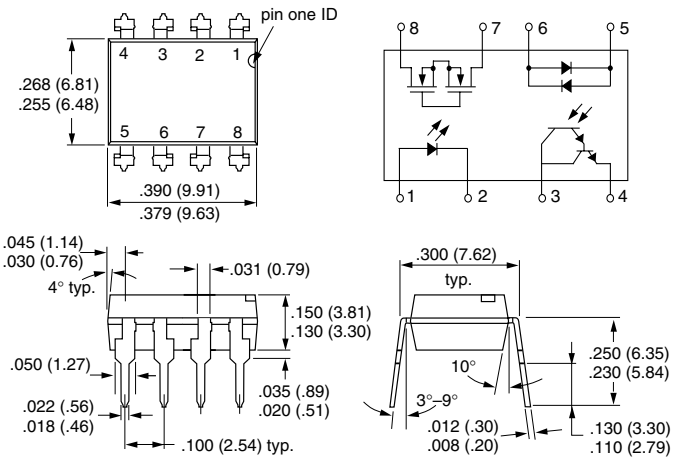
The LH1539 telecom switch consists of an optically isolated solid state relay (SSR) Form A and a bidirectional input optocoupler in a single 8-pin package. The SSR is ideal for switchhook and dial-pulse switching while the optocoupler performs ring detect and loop current sensing functions. Both the SSR and optocoupler provide 5300 V_{RMS} of input-to-output isolation voltage.

The SSR is integrated on a monolithic receptor die using smart power technology. The SSR features low ON-resistance, high breakdown voltage, and current-limit circuitry that protects the relay from telephone line induced lightning surges.

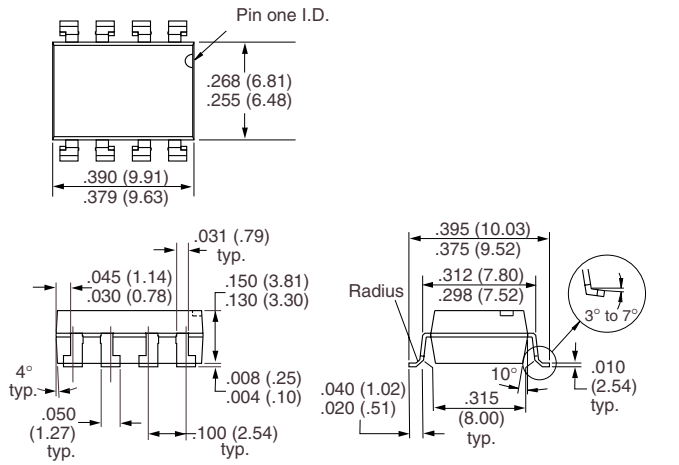
The optocoupler provides bidirectional current sensing via two antiparallel GaAs infrared emitting diodes. Very high current transfer ratio (CTR) is achieved by coupling to a photodarlington transistor. This high CTR allows the user to minimize the size of the ring detector capacitor.

Package Dimensions in Inches (mm)

DIP



SMD



Part Identification

Part Number	Description
LH1539AB	8-pin DIP, Tubes
LH1539AAC	8-pin SMD, Gullwing, Tubes
LH1539AACTR	8-pin SMD, Gullwing, Tape and Reel

Recommended Operating Conditions

Parameter	Sym.	Min.	Typ.	Max.	Unit
LED Forward Current for Switch Turn-on (T_A=–40°C to +85°C)	I_{Fon}	3.0	—	20	mA

Absolute Maximum Ratings, T_A=25°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.

SSR

LED Continuous Forward Current (I_F) ..... 50 mA
LED Reverse Voltage (I_R≤10 µA) (V_R) .....8.0 V
dc or Peak ac Load Voltage (I_L≤50 µA) (V_L) .....400 V
Continuous dc Load Current (I_L) ..... 120 mA

Optocoupler

LED Continuous Forward Current (I_F) ..... 50 mA
LED Reverse Voltage (I_R≤10 µA) (V_R) .....3.0 V
Collector-emitter Breakdown Voltage (BV_{CEO}) .....30 V
Photodarlington Power Dissipation (P_{DISS}) ..... 150 mW

Package

Ambient Operating Temperature Range (T_A) ..... –40° to +85°C
Storage Temperature Range (T_{stg}) ..... –40° to +85°C
Pin Soldering Temperature (t=10 s max) (T_S) ..... 269°C
Input/Output Isolation Voltage (t=60 s min) (V_{ISO}) ..... 5300 V_{RMS}
Total Package Power Dissipation (P_{DISS}) ..... 600 mW

Electrical Characteristics, T_A=25°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 purposes only and are not part of the testing requirements.

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Condition
SSR						
LED Forward Current, Switch Turn-on	I_{Fon}	—	0.5	1.0	mA	I_L=100 mA, t=10 ms
LED Forward Current, Switch Turn-off	I_{Foff}	0.1	0.4	—	mA	V_L=±300 V
LED Forward Voltage	V_F	0.8	1.2	1.4	V	I_F=3.0 mA
ON-resistance	R_{ON}	17	25	33	Ω	I_F=3.0 mA, I_L=±50 mA
OFF-resistance	R_{OF}	—	5000	—	GΩ	I_F=0 mA, V_L=±100 V
Current Limit	I_{LMT}	170	210	270	mA	I_F=5.0 mA, t=5.0 ms
Output Off-state Leakage Current	—	—	0.04	100	nA	I_F=0 mA, V_L=±100 V
Output Capacitance Pins 4 to 6	—	—	55 10	— —	pF pF	I_F=0 mA, V_L=1.0 V I_F=0 mA, V_L=50 V
Turn-on Time	t_{on}	—	—	2.0	ms	I_F=5.0 mA, I_L=50 mA
Turn-off Time	t_{off}	—	—	0.5	ms	I_F=5.0 mA, I_L=50 mA
Optocoupler						
LED Forward Voltage	V_F	0.9	1.2	1.5	V	I_F=10 mA
dc Current Tranfer Ratio	CTR	300	—	—	%	I_F=0.05 mA, V_{CE}=0.9 V
Saturation Voltage	V_{CEsat}	—	—	1.0	V	I_F=0.05 mA, I_C=0.15 mA
Leakage Current	I_{CEO}	—	—	N/A	—	I_F=0 mA, V_{CE}=5.0 V

Typical Performance Characteristics

Figure 1. LED Voltage vs. Temperature

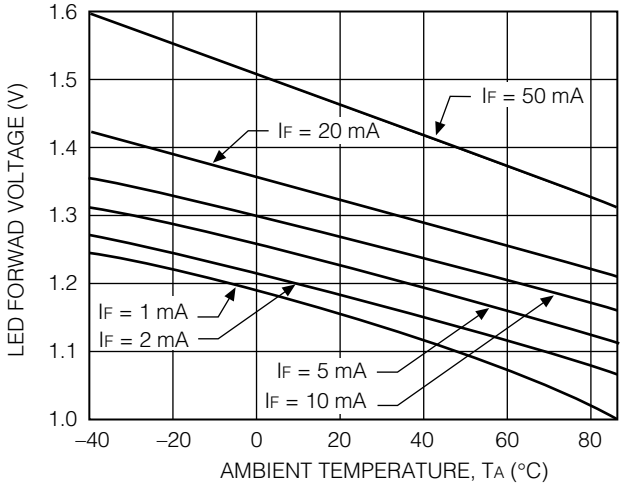


Figure 2. LED Current for Switch Turn-on/off vs. Temperature

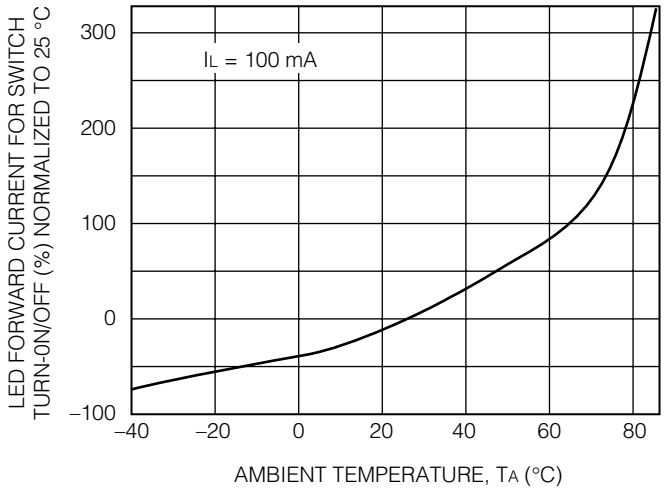


Figure 3. ON-Resistance vs. Temperature

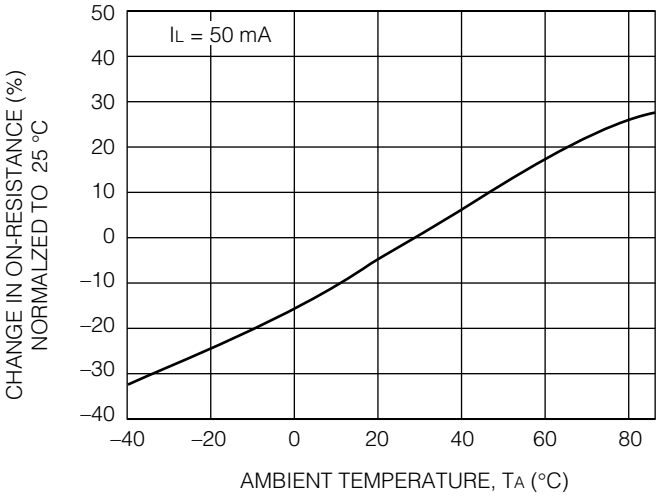


Figure 4. LED Dropout Voltage vs. Temperature

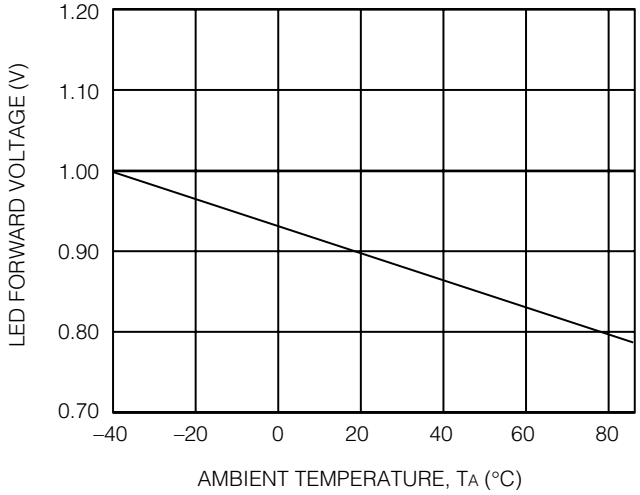


Figure 5. Current Limit vs. Temperature

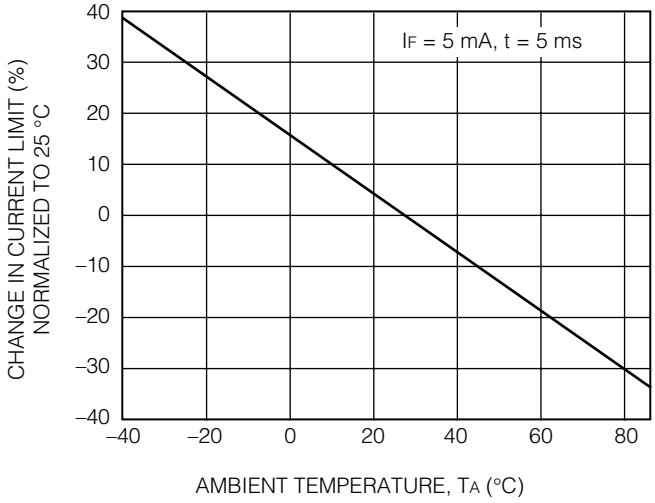


Figure 6. Variation in ON-Resistance vs. LED Current

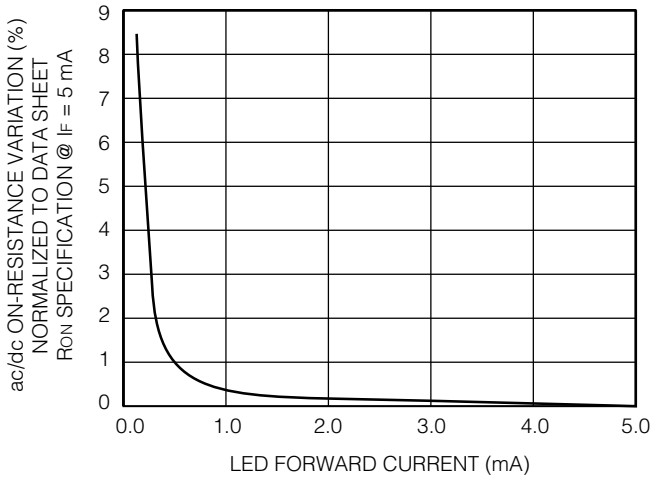


Figure 7. Switch Capacitance vs. Applied Voltage

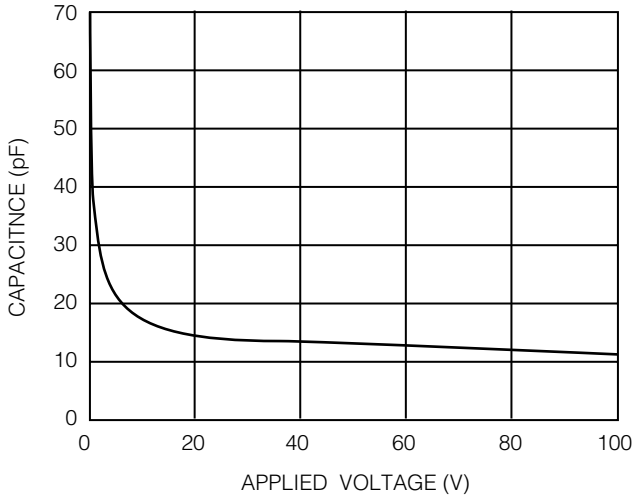


Figure 8. Output Isolation

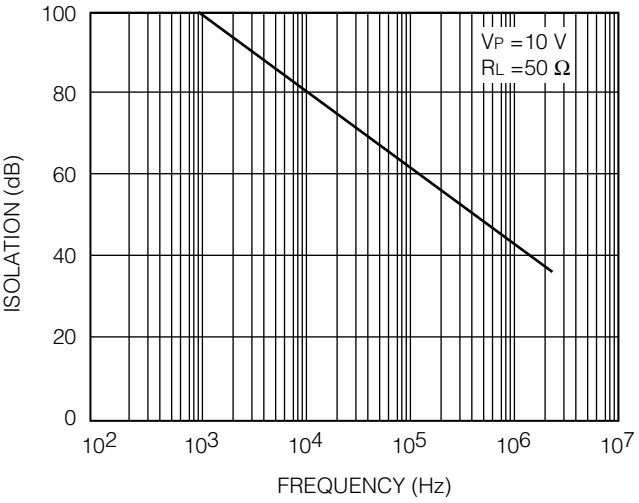


Figure 9. Leakage Current vs. Applied Voltage at Elevated Temperatures

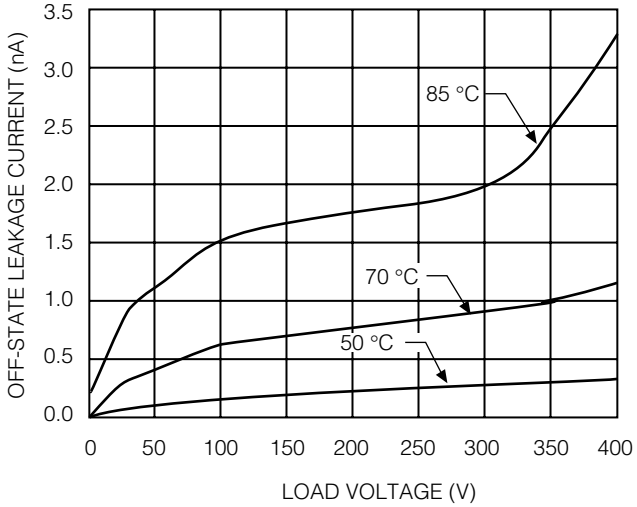


Figure 10. Insertion Loss vs. Frequency

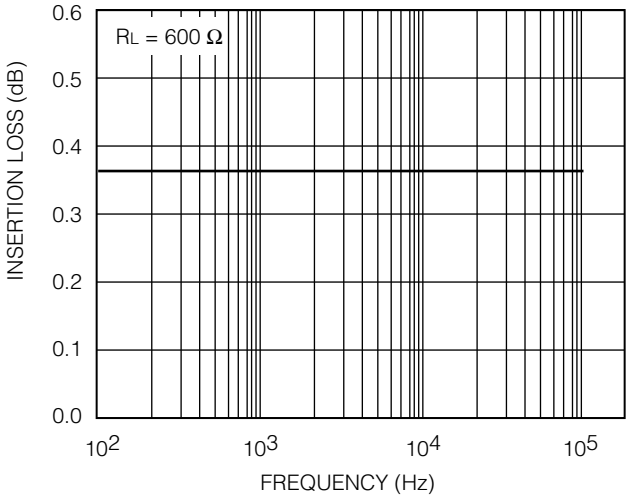


Figure 11. Leakage Current vs. Applied Voltage

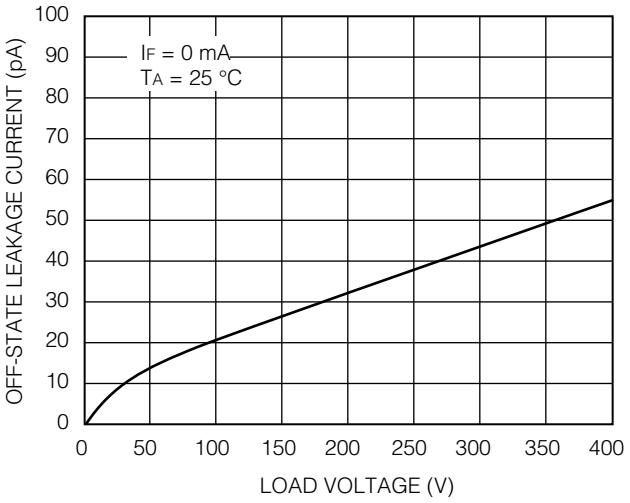


Figure 12. Switch Breakdown Voltage vs. Temperature

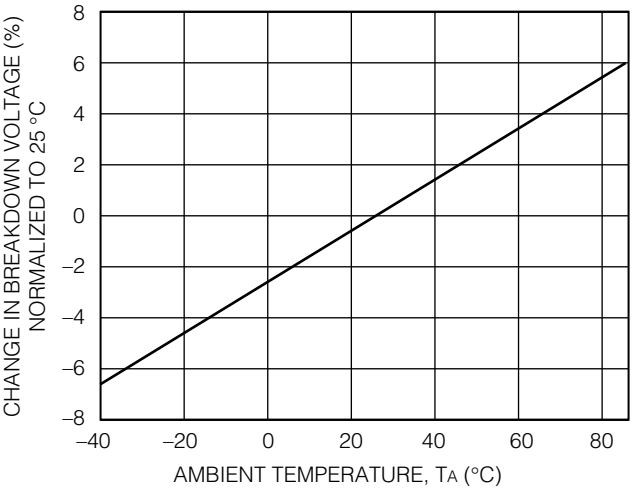


Figure 13. Switch Offset Voltage vs. Temperature

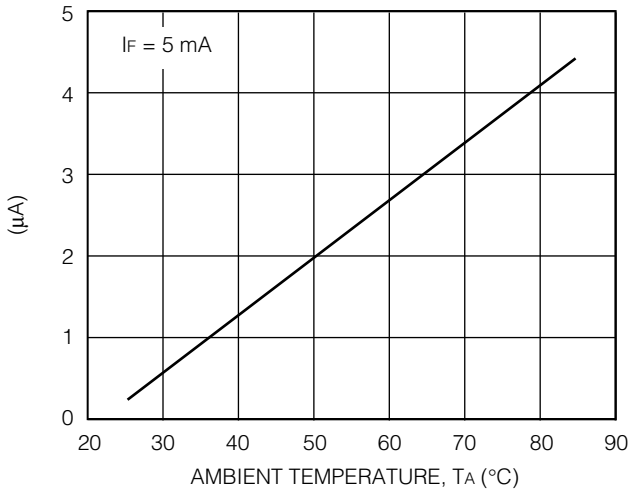


Figure 14. Turn-On Time vs. Temperature

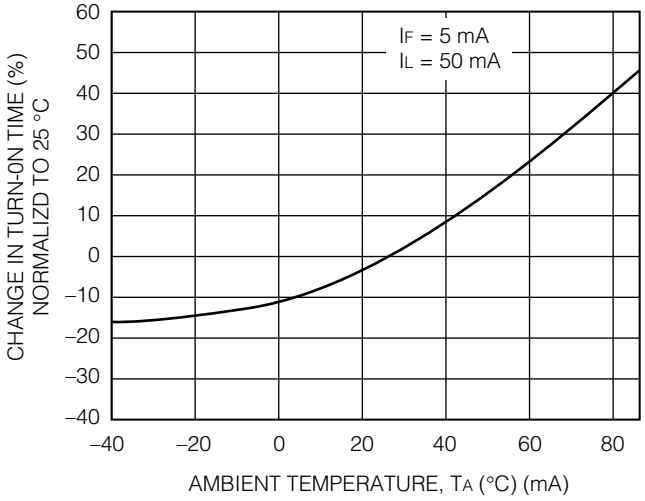


Figure 15. Turn-On Time vs. LED Current

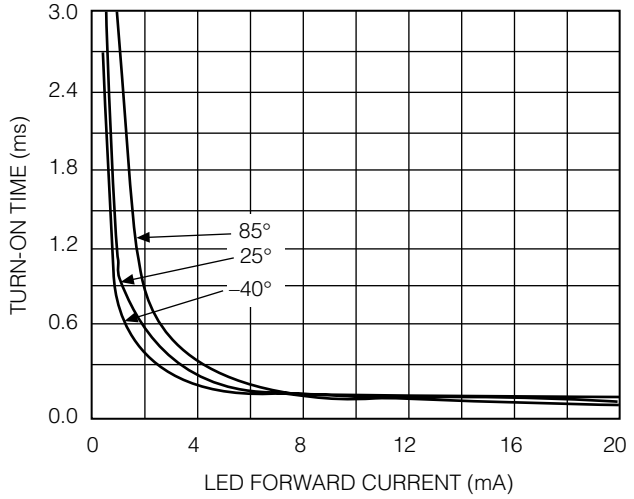


Figure 16. LED Offset Voltage vs. LED Current

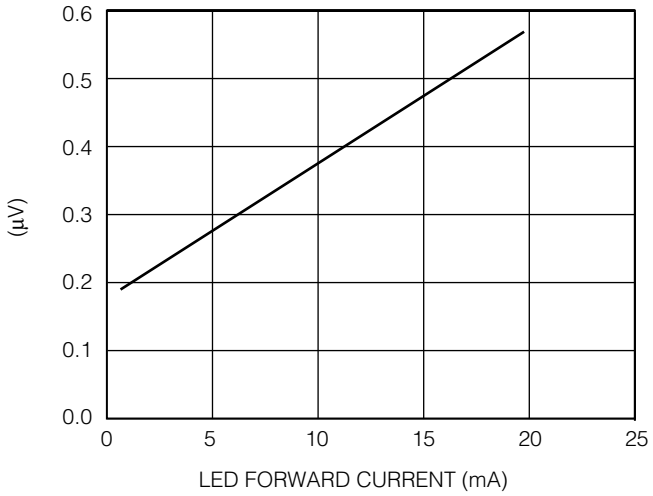


Figure 17. Turn-Off Time vs. Temperature

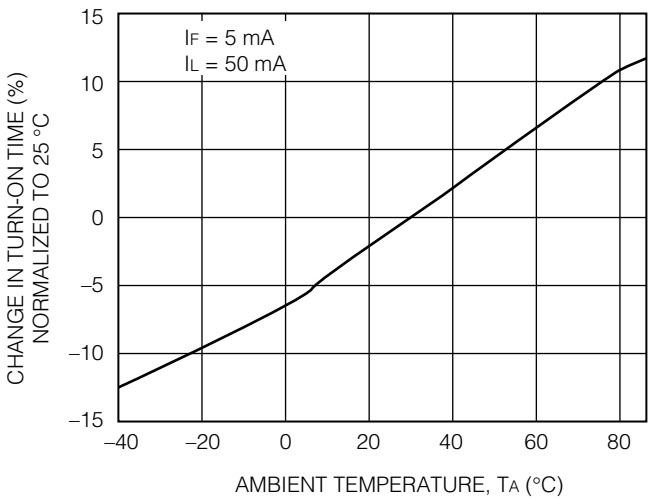


Figure 18. Turn-off Time vs. LED Current