LH1510AT/AAB/AABTR

1 Form A
Solid State Relay

FEATURES

- 5300 V_{RMS} I/O Isolation
- Current-limit Protection Built-in
- Linear AC/DC Operation
- High-reliability Monolithic Receptor
- Low Power Consumption
- Clean, Bounce-free Switching
- High Surge Capability
- Surface Mountable
- Flammability; UL94,VØ

AGENCY APPROVALS

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

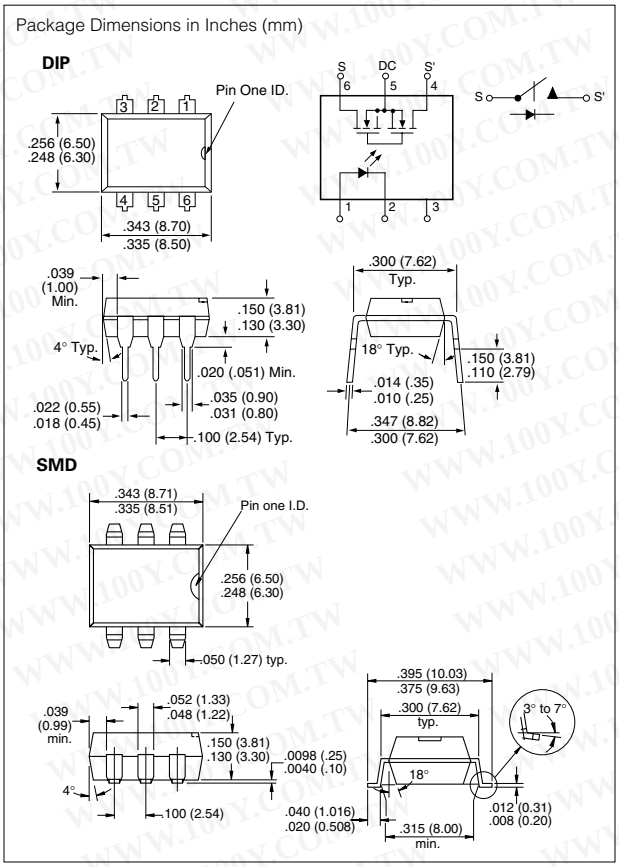
APPLICATIONS

- General Telecom Switching
  - On/off-hook
  - Ring Relay
  - Dial Pulse
  - Ground Start
  - Ground Fault Protection
- Instrumentation
  - Automatic Tuning/Balancing
  - Flying Capacitor
  - Analog Multiplex
- Industrial Controls
  - Triac Predrivers
  - Output Modules
- Peripherals
  - Transducer Driver

DESCRIPTION

The LH1510 is a SPST normally open switch (1 Form A) that can replace electromechanical relays in many applications. The relay is constructed using a GaAlAs LED for actuation control and an integrated monolithic die for the switch output. The die, fabricated in a high-voltage dielectrically isolated technology, is comprised of a photodiode array, switch control circuity, and MOSFET switches. In addition, the relay employs current-limiting circuity enabling it to pass FCC 68.302 and other regulatory voltage surge requirements when overvoltage protection is provided. The LH1510 is the only relay in the family that provides current limiting for unidirectional dc applications.

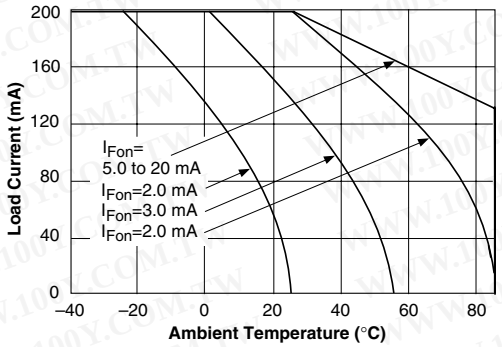
Package Dimensions in Inches (mm)



Part Identification

Part Number	Description
LH1510AT	6-pin DIP, Tubes
LH1510AAB	6-pin SMD, Gullwing, Tubes
LH1510AABTR	6-pin SMD, Gullwing, Tape and Reel

Recommended Operating Conditions



Absolute Maximum Ratings, T_A=25°C (except where noted)

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 (V_{ISO})..... 5300 V_{RMS}
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 mA) (V_L).....200 V
Continuous DC Load Current (I_L)
Bidirectional Operation.....200 mA
Unidirectional Operation.....350 mA
Peak Load Current (t=100 ms) (single shot) (I_P).....†
Output Power Dissipation (continuous) (P_{DISS}).....550 mW

† Refer to Current Limit Performance Application Note 58 for a discussion on relay operation during transient currents.

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 only and are not part of the testing requirements.

Parameter	Sym.	Min.	Typ.	Max.	Units	Test Conditions
Input						
LED Forward Current, Switch Turn-on	I_{Fon}	—	0.95	2.0	mA	I_L=100 mA, t=10 ms
LED Forward Current, Switch Turn-off	I_{Foff}	0.2	0.85	—	mA	V_L±150 V
LED Forward Voltage	V_F	1.15	1.27	1.45	V	I_F=10 mA
Output						
ON-resistance ac/dc: Pin 4 (±) to 6 (±)	R_{ON}	6.0	11.27	15	Ω	I_F=5.0 mA, I_L=50 mA
dc: Pin 4, 6 (+) to 5 (±)		1.5	3.15	3.75		I_F=5.0 mA, I_L=100 mA
OFF-resistance	R_{OFF}	0.5	80	—	GΩ	I_F=0 mA, V_L=±100 V
Current Limit ac/dc: Pin 4 (±) to 6 (±)	I_{LMT}	300	368	450	mA	I_F=5.0 mA, t=5.0 ms V_L=±5.0 V
dc: Pin 4, 6 (+) to 5 (±)		600	736	920		I_F=5.0 mA, V_L=4.0 mA t=5.0 ms
Off-state Leakage Current	I_O	—	2.36	200	nA	I_F=0 mA, V_L=±100 V
		—	79.2	1.0	µA	I_F=0 mA, V_L=±200 V
Output Capacitance Pin 4 to 6	C_O	—	27.75	—	pF	I_F=0 mA, V_L=1.0 V
		—	10.82	—		I_F=0 mA, V_L=50 V
Switch Offset	V_{OS}	—	0.167	—	µV	I_F=5.0 mA
Transfer						
Input/Output Capacitance	C_{ISO}	—	0.72	—	pF	V_{ISO}=1.0 V
Turn-on Time	t_{on}	—	0.502	2.0	ms	I_F=5.0 mA, I_L=50 mA
Turn-off Time	t_{off}	—	0.755	2.0	ms	I_F=5.0 mA, I_L=50 mA

Typical Performance Characteristics

Figure 1. LED Voltage vs. Temperature

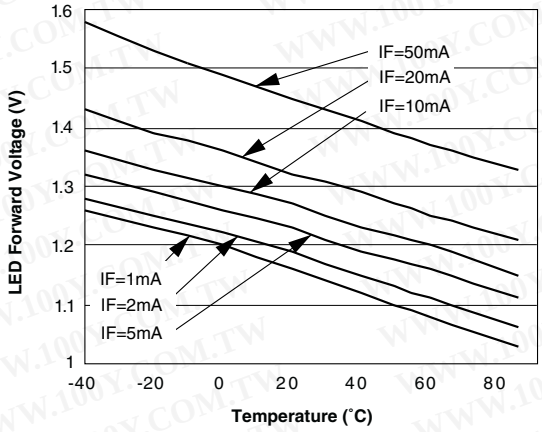


Figure 2. LED Forward Current vs. LED Forward Voltage

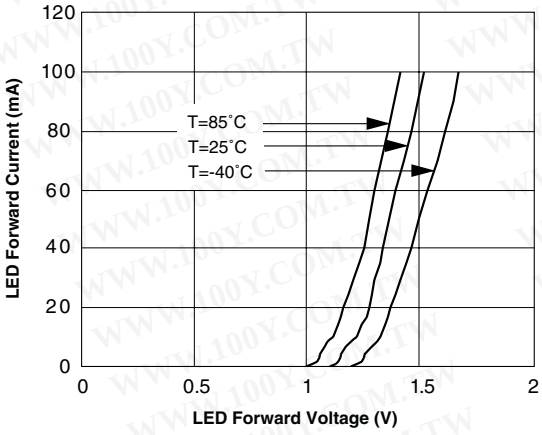


Figure 3. LED Reverse Current vs. LED Reverse Voltage

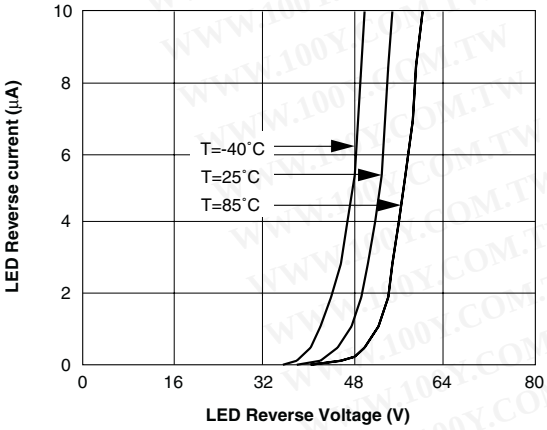


Figure 4. LED Current vs. Load Voltage

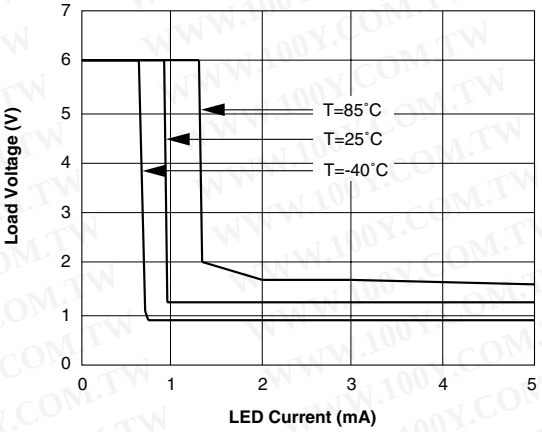


Figure 5. LED Current for Switch Turn-on vs. Temperature

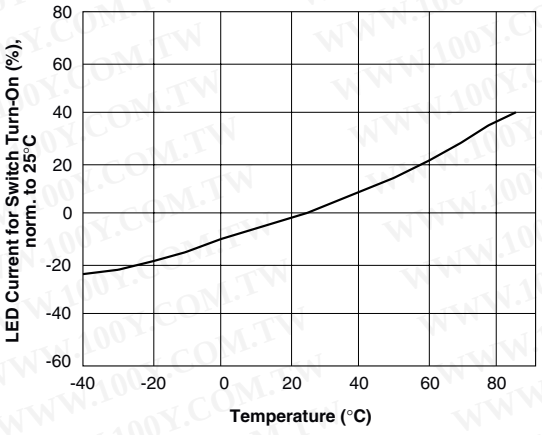


Figure 6. LED Drop-Out Voltage vs. Temperature

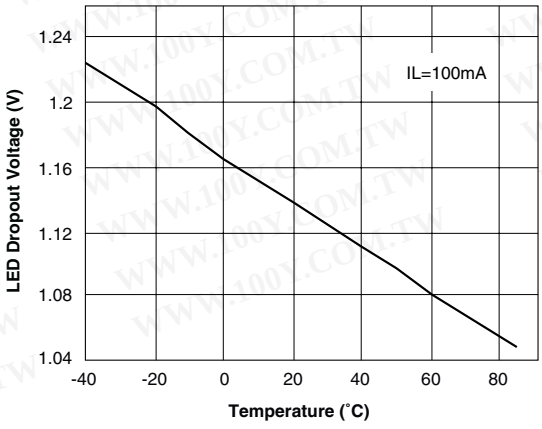


Figure 7. DC Load Current vs. Load Voltage

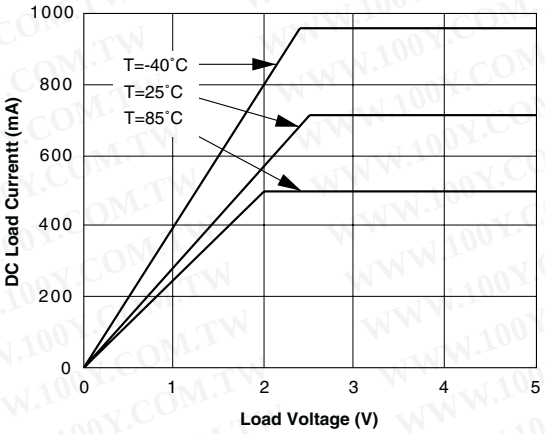


Figure 8. DC Current Limit vs. Temperature

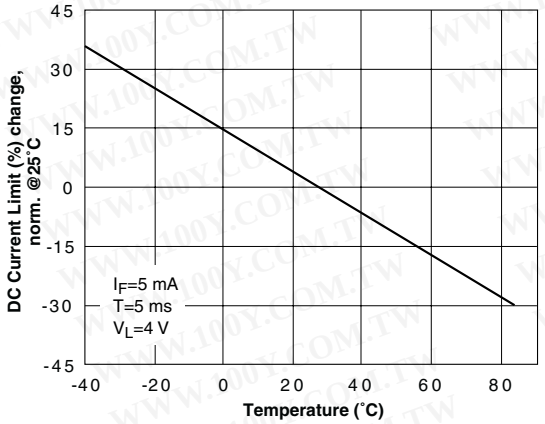


Figure 9. Current Limit vs. Temperature

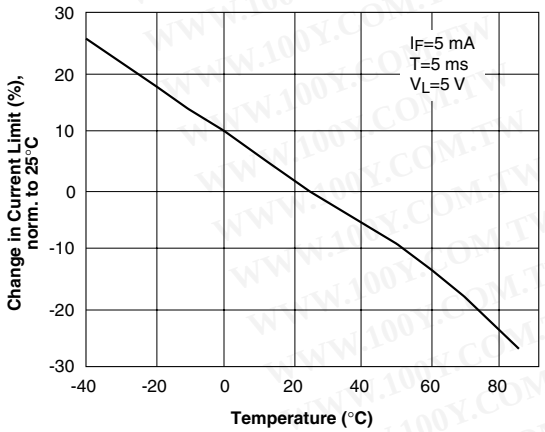


Figure 10. Load Current vs. Load Voltage

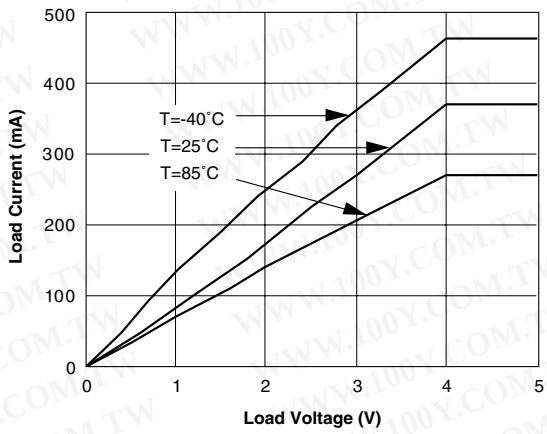


Figure 11. On-Resistance vs. Temperature

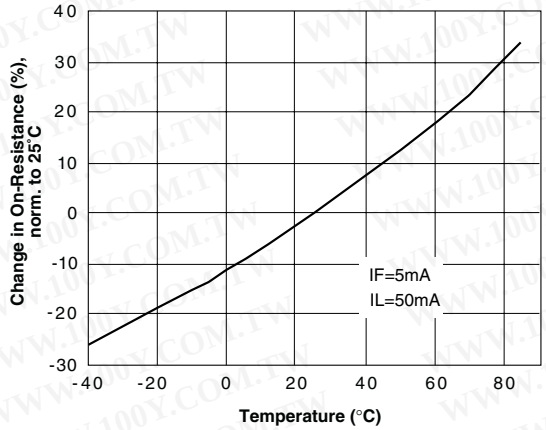


Figure 12. Variation in ON-resistance vs. LED Current

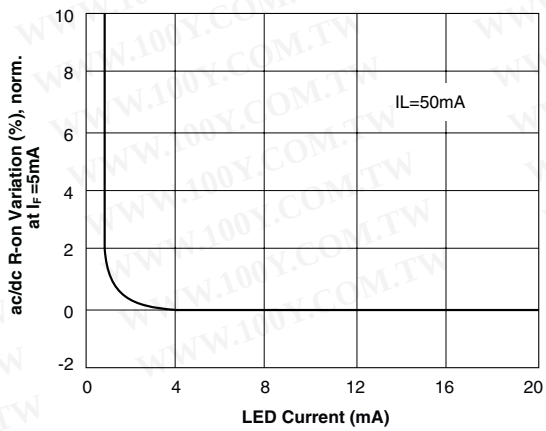


Figure 13. Switch Terminal Capacitance vs. Applied Voltage

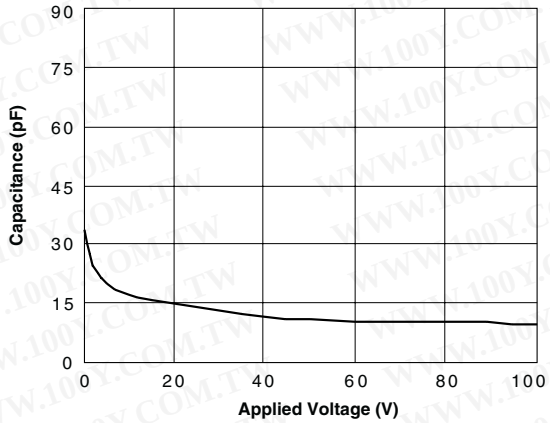


Figure 14. Insertion Loss

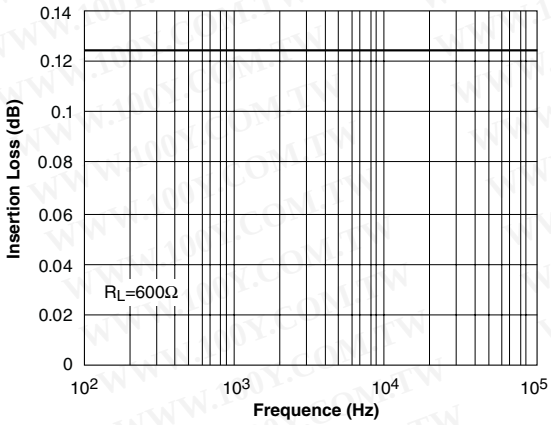


Figure 15. Leakage Current vs. Applied Voltage

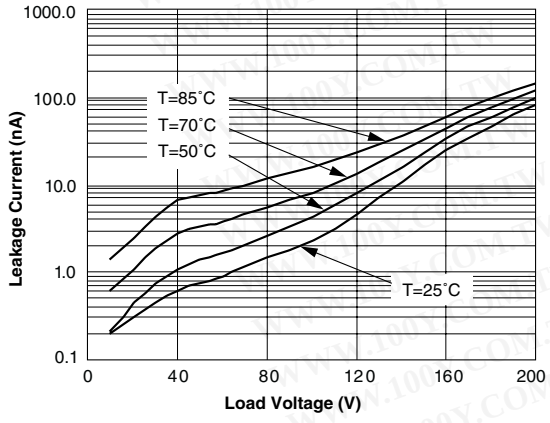


Figure 16. Output Isolation

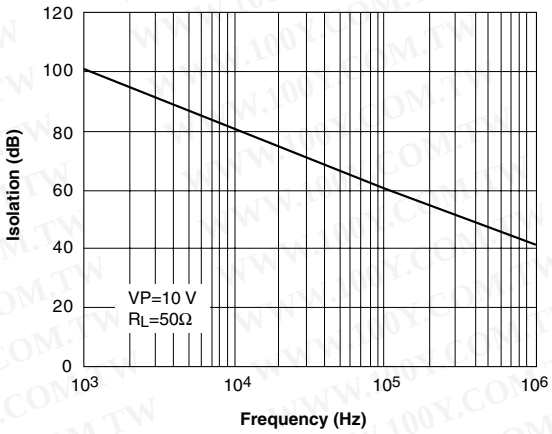


Figure 17. Switch Breakdown Voltage vs. Load Current

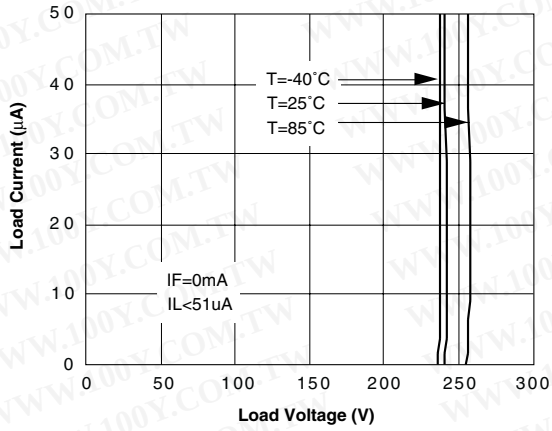


Figure 18. Switch Breakdown Voltage vs. Temperature

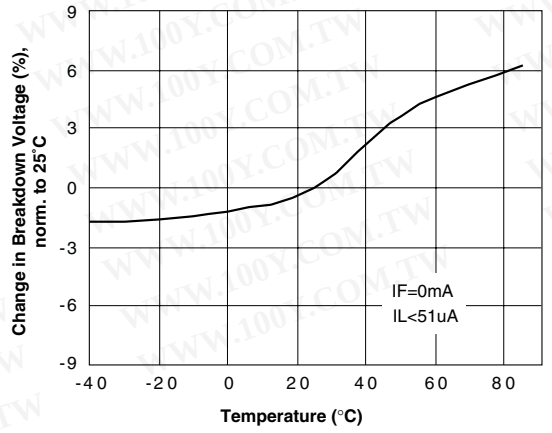


Figure 19. Switch Offset Voltage vs. Temperature

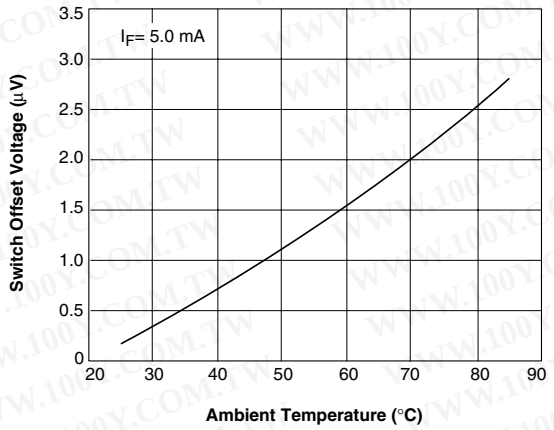


Figure 20. Switch Offset Voltage vs. LED Current

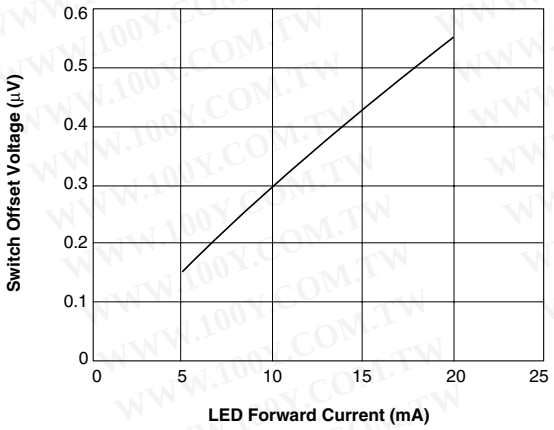


Figure 21. Turn-On Time vs. Temperature

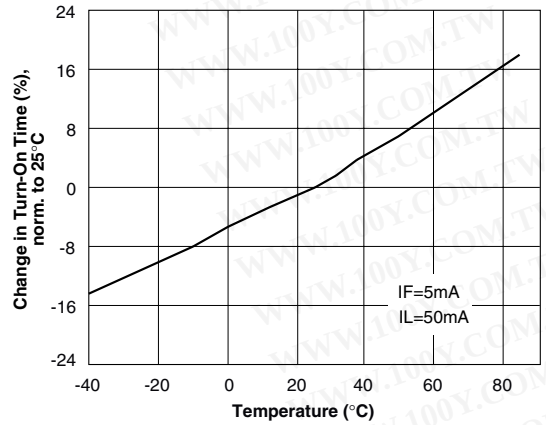


Figure 22. Turn-Off Time vs. Temperature

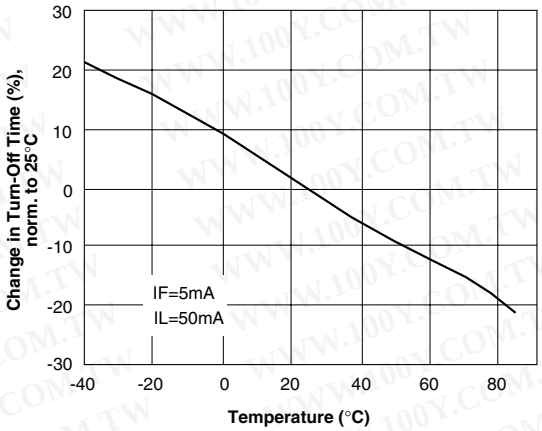


Figure 23. Turn-On Time vs. LED Current

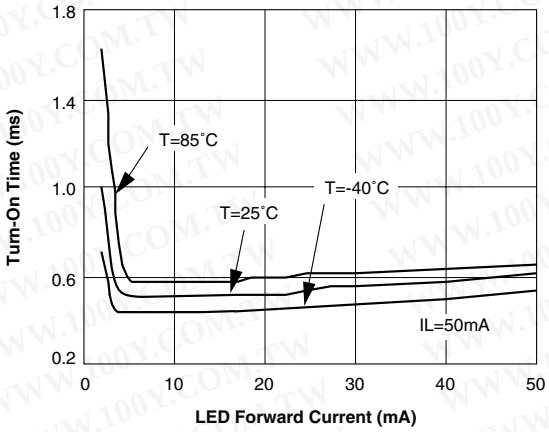


Figure 24. Turn-Off Time vs. LED Current