LH1512AB/AAC/AACTR

Dual 1 Form A/B, C
Solid State Relay

FEATURES

- **Current Limit Protection**
- **I/O Isolation, 5300 V_{RMS}**
- **Typical R_{ON} 10 Ω**
- **Load Voltage 200 V**
- **Load Current 200 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**

APPLICATIONS

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

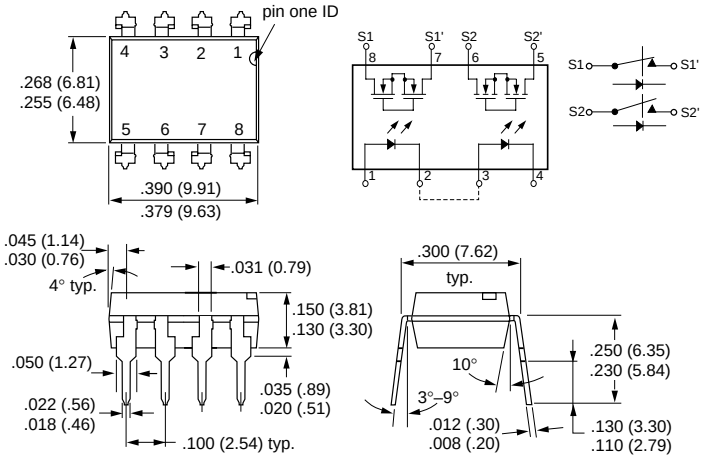
DESCRIPTION

The LH1512 relays contain normally open and normally closed switches that can be used independently as a 1 Form A and 1 Form B relay, or when used together, as a 1 Form C relay. The relays are constructed using GaAlAs LEDs for actuation control and integrated monolithic dies for the switch outputs.

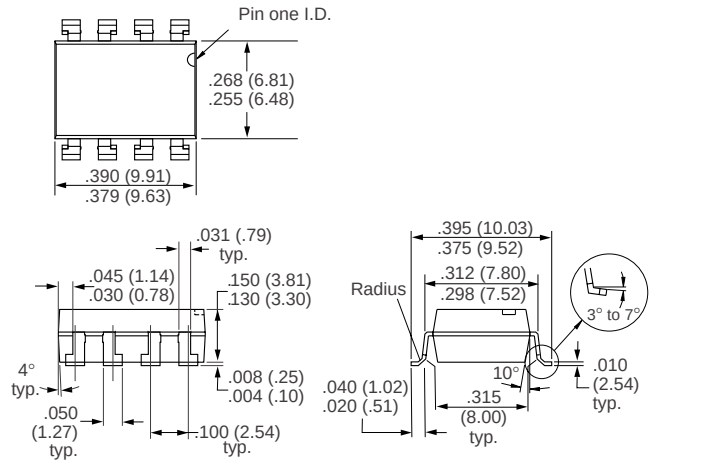
The die, fabricated in a high-voltage dielectrically isolated technology, is comprised of a photodiode array, switch control circuity, and MOSFET switches.

Package Dimensions in Inches (mm)

DIP



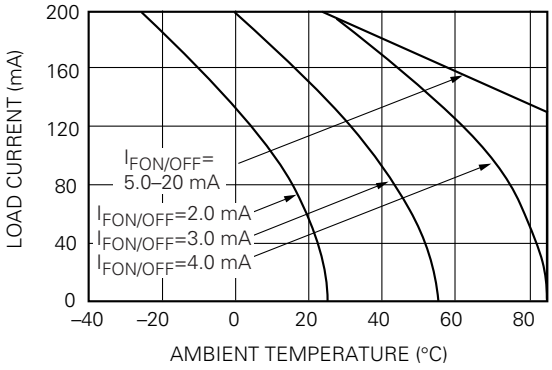
SMD



Part Identification

Part Number	Description
LH1512AB	8-pin DIP, Tubes
LH1512AAC	8-pin SMD, Gullwing, Tubes
LH1512AACTR	8-pin SMD, Gullwing, Tape and Reel

Recommended Operating Conditions



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 the data sheet. Exposure to maximum rating conditions for extended periods can adversely affect device reliability.

Ambient Operating 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 Test Voltage,
t=1.0 s, I_{ISO}=10 µA 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≤10 µA, V_R .....8.0 V
dc or Peak ac Load Voltage, I_L≤50 µA, V_L .....200 V
Continuous dc Load Current, I_L
(Form C Operation) .....200 mA
Peak Load Current, I_P
(t=100 ms) Form A .....†
(single shot) Form B .....600 mA
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°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 for Switch Turn-on (NO)	I_{Fon}	—	0.6	2.0	mA	I_L=100 mA, t=10 ms
LED Forward Current for Switch Turn-off (NO)	I_{Foff}	0.2	0.5	—	mA	V_L=±150 V
LED Forward Current for Switch Turn-on (NC)	I_{Fon}	0.2	0.9	—	mA	I_L=100 mA, t=10 ms
LED Forward Current for Switch Turn-off (NC)	I_{Foff}	—	1.0	2.0	mA	V_L=±150 V
LED Forward Voltage	V_F	1.15	1.26	1.45	V	I_F=10 mA
Output						
ON-resistance: (NO, NC)	R_{ON}	6.0	10	15	Ω	I_F=5.0 mA (NO) 0 mA (NC) I_L=50 mA (NC)
OFF-resistance: (NO)	R_{OFF}	0.5	5000	—	GΩ	I_F=0 mA, V_L=±100 V
(NC)		0.1	1.4	—		I_F=5.0 mA, V_L=±100 V
Current Limit (NO)	I_{LMT}	300	360	460	mA	I_F=5.0 mA, t=5.0 ms V_L=±5.0 V
Off-state Leakage Current: (NO)	—	—	0.02	200	nA	I_F=0 mA, V_L=±100 V
(NC)		—	0.07	1.0	µA	I_F=5.0 mA, V_L=±100 V
(NO, NC)		—	—	1.0		I_F=0 mA (NO) I_F=5.0 mA, V_L=±200 V

Parameter	Sym.	Min.	Typ.	Max.	Units	Test Conditions
Output Capacitance: (NO)	—	—	60	—	pF	I_F=0 mA, V_L=1.0 V
		—	15	—		I_F=0 mA, V_L=50 V
(NC)		—	45	—		I_F=5.0 mA, V_L=1.0 V
		—	15	—		I_F=5.0 mA, V_L=50 V
Pole-to-Pole Capacitance (S1 to S2)	—	—	0.5	—	pF	I_F=0 mA
Switch Offset: (NO)	—	—	0.15	—	µV	I_F=5.0 mA (NO) I_F=5.0 mA (NC)
(NC)		—	0.1	—		I_F=0 mA (NC) I_F=5.0 mA (NO)
Transfer						
Input/Output Capacitance	C_{ISO}	—	1.1	—	pF	V_{ISO}=1.0 V
Turn-on Time (NO)	t_{on}	—	1.4	3.0	ms	I_F=10 mA, I_L=50 mA
(NC)		—	1.2	3.0		I_F=10 mA, I_L=50 mA
Turn-off Time (NO)	t_{off}	—	0.7	3.0	ms	I_F=10 mA, I_L=50 mA
(NC)		—	2.0	3.0		I_F=10 mA, I_L=50 mA
Turn-on Time (NO)	t_{on}	NA	NA	NA	ms	I_F=10 mA, I_L=37.5 mA V_L=150 V
(NC)		NA	NA	NA		I_F=10 mA, I_L=37.5 mA V_L=150 V
Turn-off Time (NO)	t_{off}	NA	NA	NA	ms	I_F=10 mA, I_L=37.5 mA V_L=150 V
(NC)		NA	NA	NA		I_F=10 mA, I_L=37.5 mA V_L=150 V
Transfer OFF Time (NC off to NO on)	t_{tfr}	NA	NA	NA	µs	I_F=10 mA, I_L=37.5 mA V_L=150 V
(NO off to NC on)		NA	NA	NA		I_F=10 mA, I_L=37.5 mA V_L=150 V

Typical Performance Characteristics

Figure 1. LED Voltage vs. Temperature

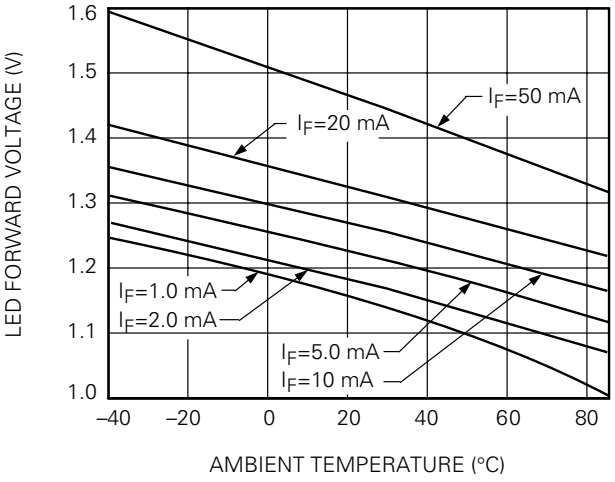


Figure 2. LED Dropout Voltage vs. Temperature

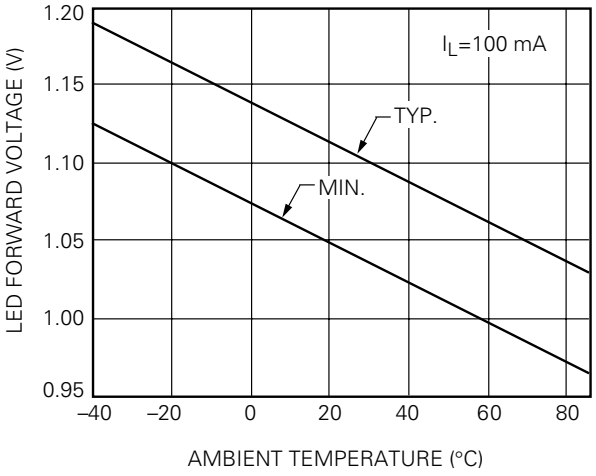


Figure 3. LED Current for Switch Turn-off vs. Temperature

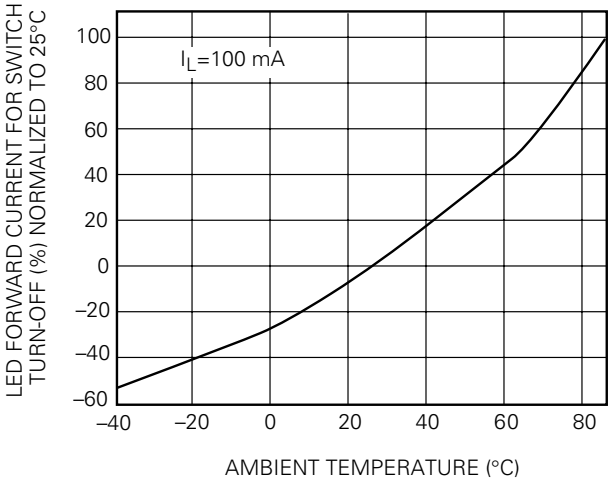


Figure 4. Current Limit vs. Temperature

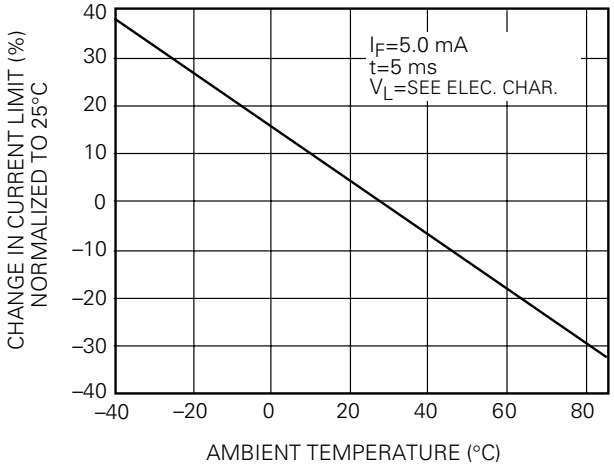


Figure 5. ON-resistance vs. Temperature

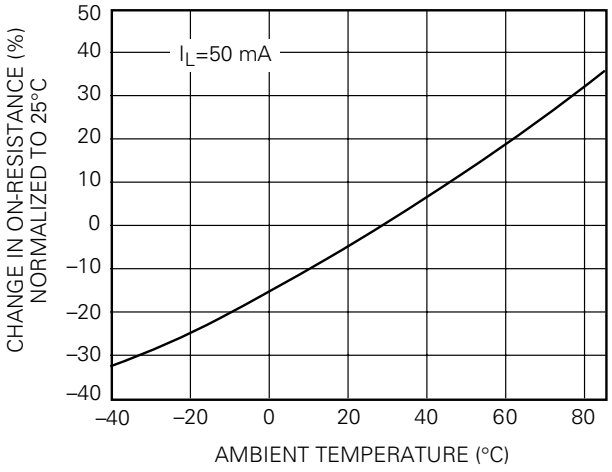


Figure 6. Variation in ON-resistance vs. LED Current

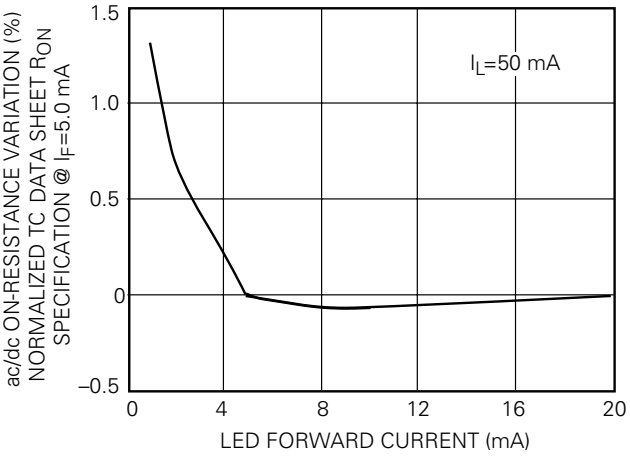


Figure 7. Switch Capacitance vs. Applied Voltage

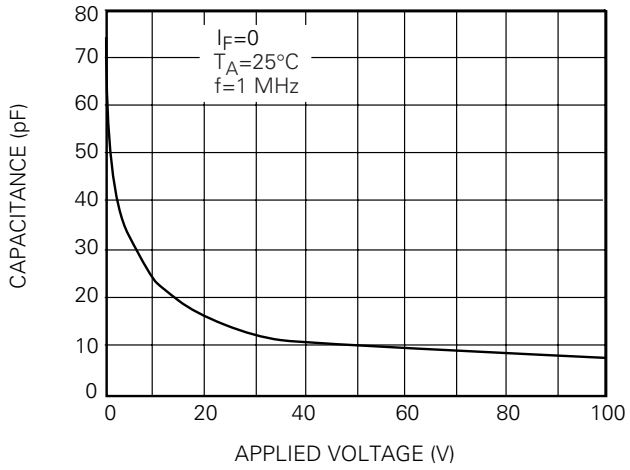


Figure 8. Insertion Loss vs. Frequency

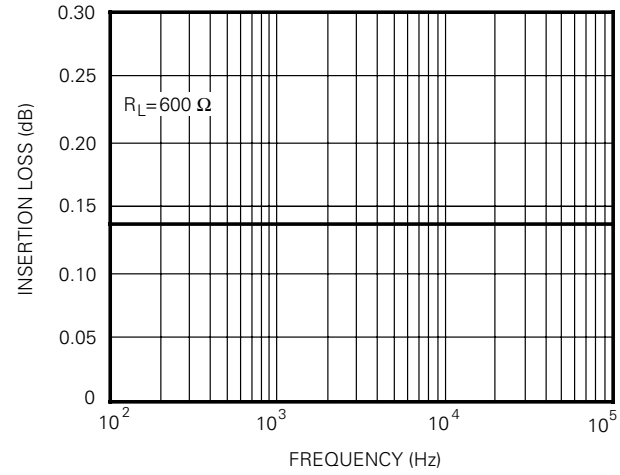


Figure 9. NO Output Isolation

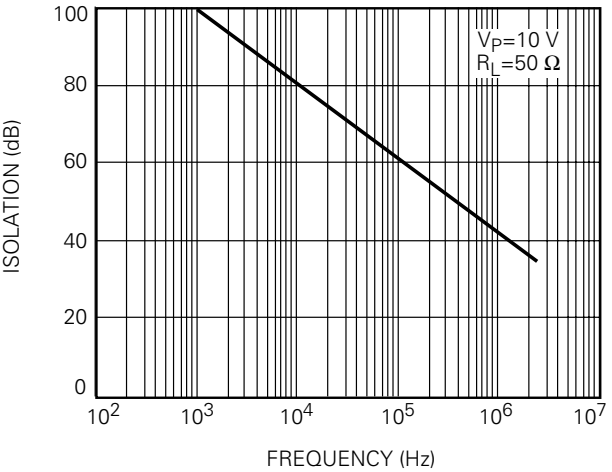


Figure 10. NC Output Isolation

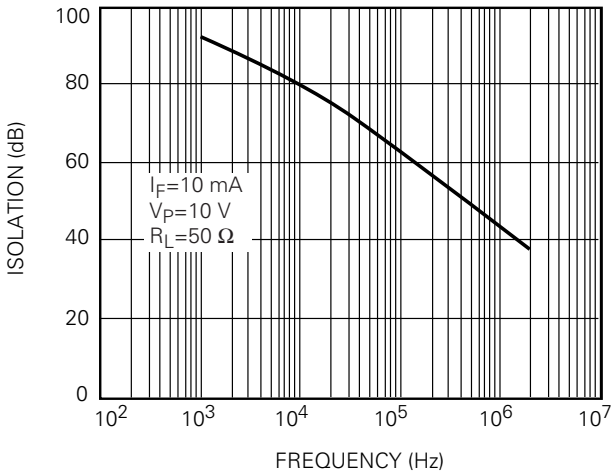


Figure 11. NO Leakage Current vs. Applied Voltage

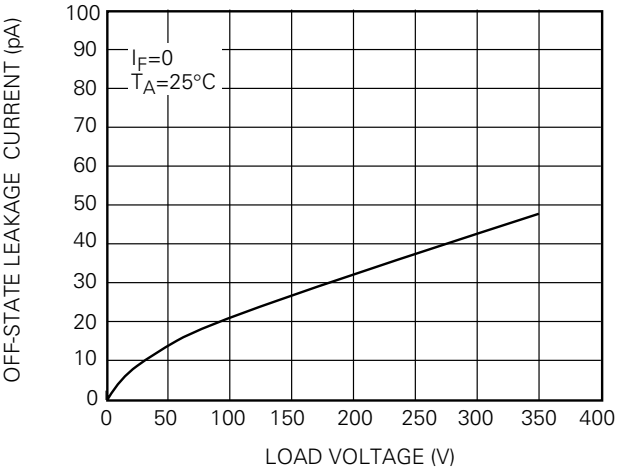


Figure 12. NO Leakage Current vs. Applied Voltage at Elevated Temperatures

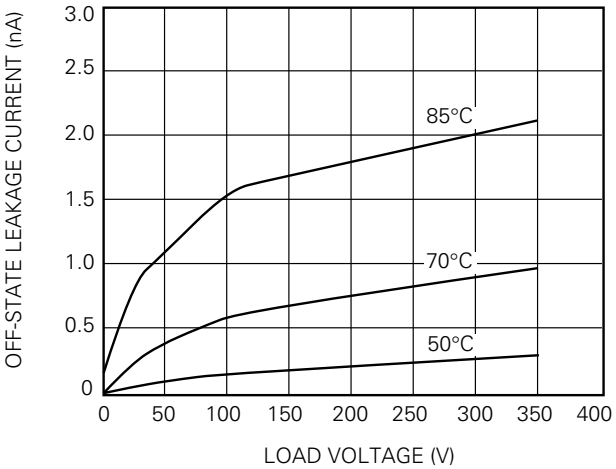


Figure 13. NC Leakage Current vs. Applied Voltage at 25°C

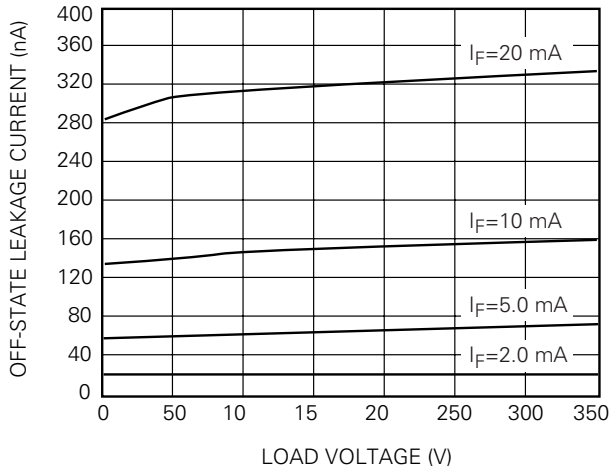


Figure 14. NC Leakage Current vs. Applied Voltage at 50°C

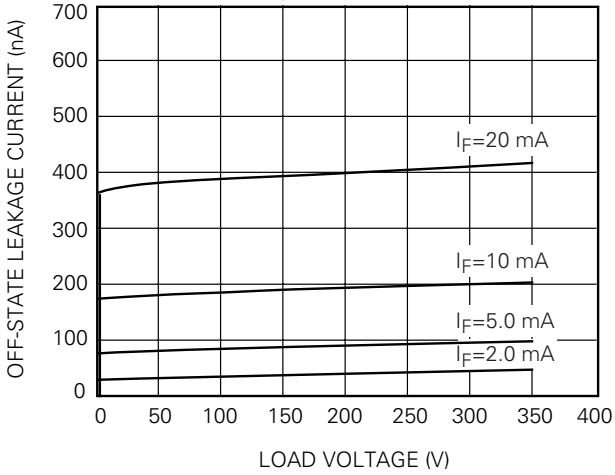


Figure 15. NC Leakage Current vs. Applied Voltage at 70°C

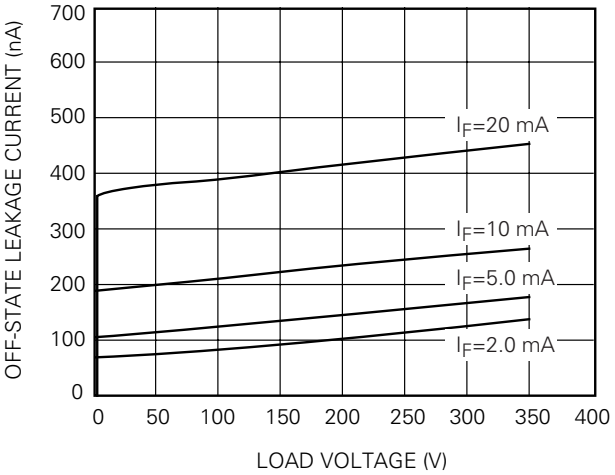


Figure 16. NC Leakage Current vs. Applied Voltage at 85°C

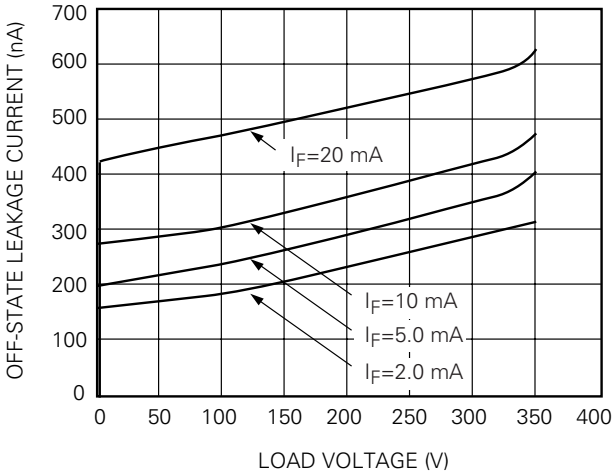


Figure 17. Switch Breakdown Voltage vs. Temperature

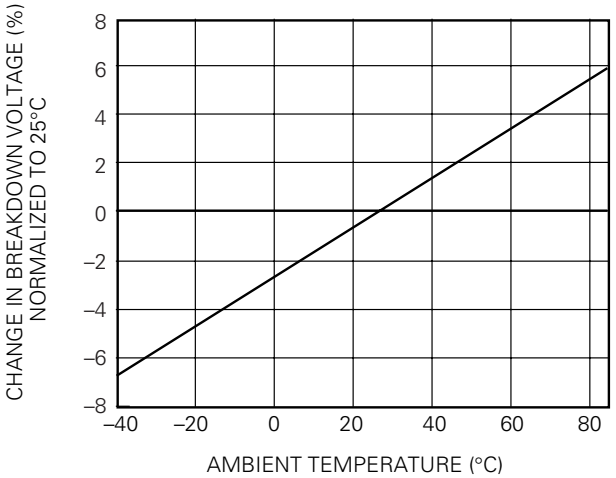


Figure 18. Switch Offset Voltage vs. Temperature

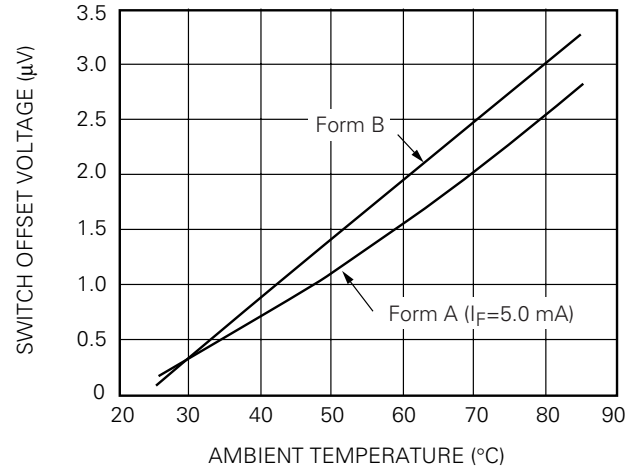


Figure 19. NO Switch Offset Voltage vs. LED Current

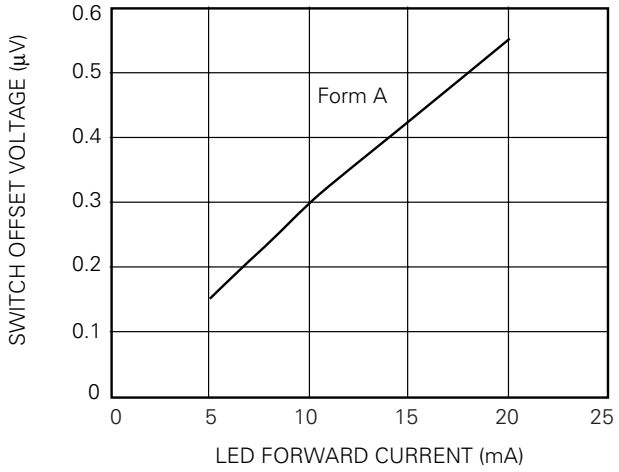


Figure 20. NO Turn-on Time vs. Temperature

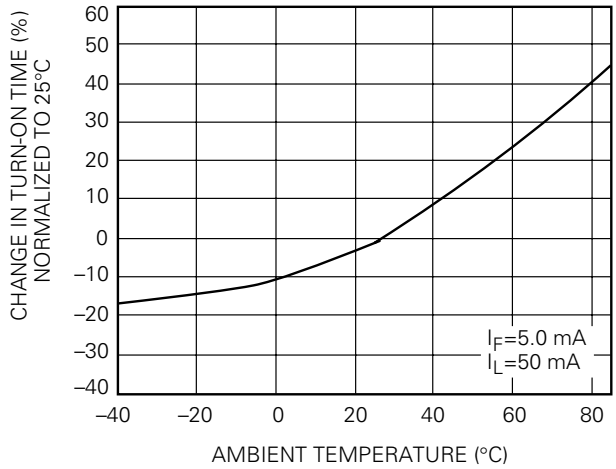


Figure 21. NO Turn-off Time vs. Temperature

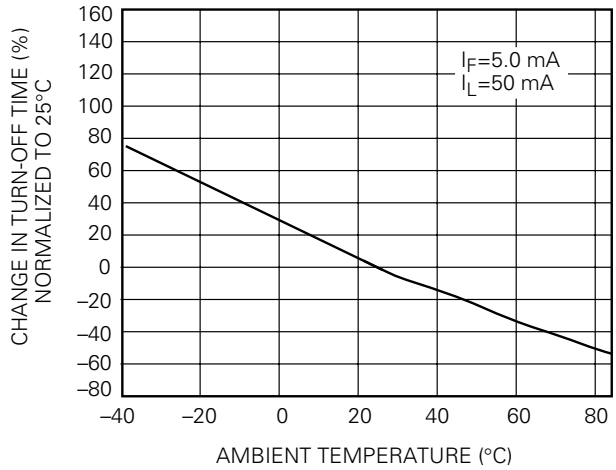


Figure 22. NC Turn-on/off Time vs. Temperature

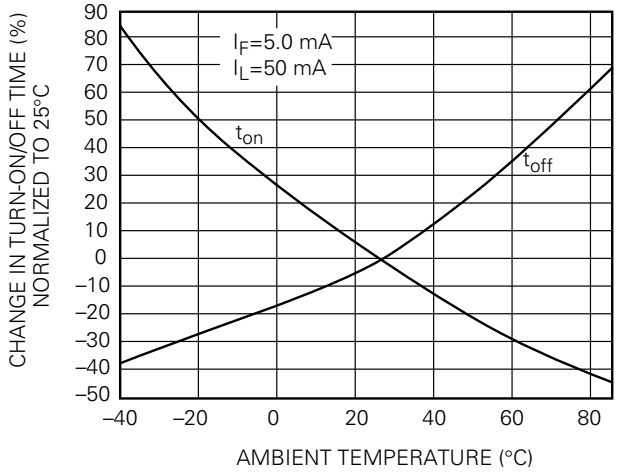


Figure 23. NO Turn-on Time vs. LED Current

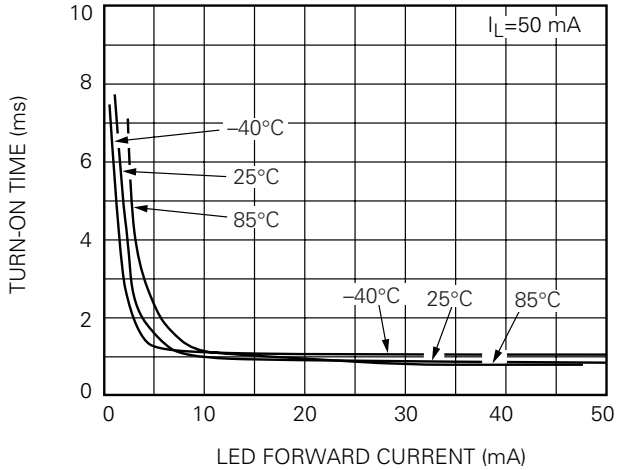


Figure 24. NC Turn-on Time vs. LED Current

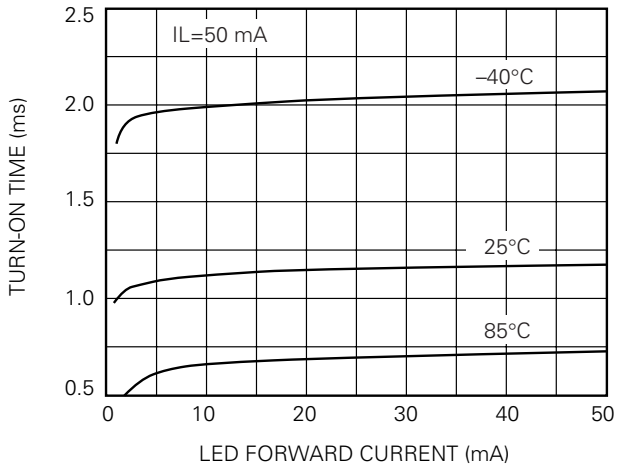


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Figure 25. NO Turn-Off Time vs. LED Current

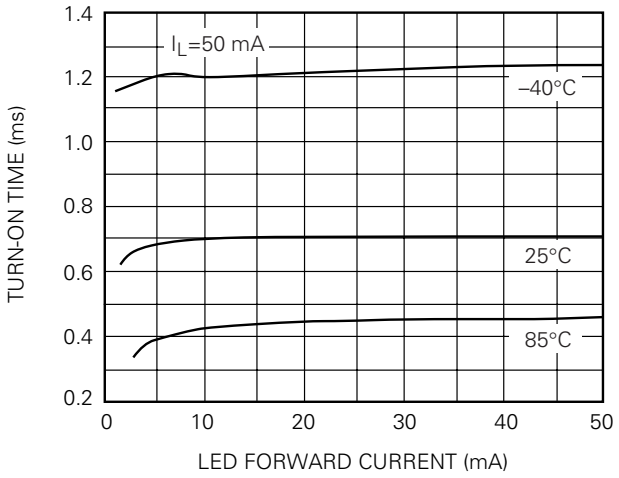

Figure 26. NC Turn-Off Time vs. LED Current