

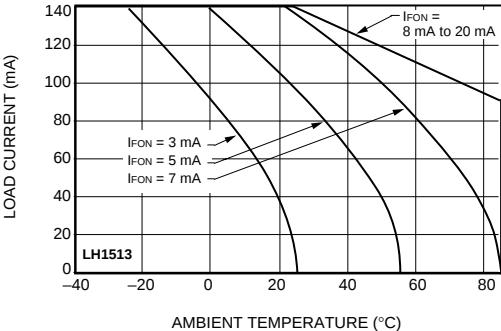
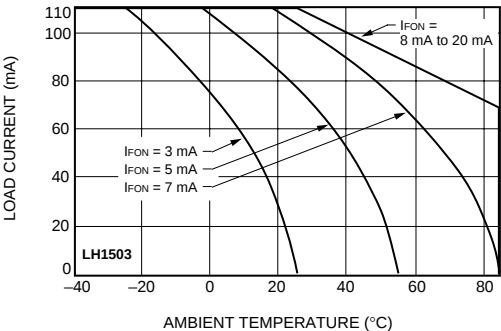
Absolute Maximum Ratings $T_A=25^{\circ}\text{C}$
Stresses in excess of the Absolute Maximum Ratings can cause permanent damage to the device. These are absolute stress ratings only. Functional operation of the

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.

Parameter	Symbol	Test Conditions	LH1503	LH1513	Units
Ambient Operating Temperature Range	T_A	—	−40 to +85	−40 to +85	$^{\circ}\text{C}$
Storage Temperature Range	T_{stg}	—	−40 to +150	−40 to +150	$^{\circ}\text{C}$
Pin Soldering Temperature	T_S	$t=10\text{ s max}$	260	260	$^{\circ}\text{C}$
Input/Output Isolation Voltage	V_{ISO}	—	3750	3750	V_{rms}
Pole-to-Pole Isolation Voltage (S1 to S2)	—	—	500	500	V
LED Continuous Forward Current	I_F	—	50	50	mA
LED Reverse Voltage	V_R	$I_R \leq 10\text{ }\mu\text{A}$	8	8	V
dc or Peak ac Load Voltage	V_L	$I_L \leq 50\text{ }\mu\text{A}$	350	200	V
Continuous dc Load Current One Pole Operating Two Poles Operating	I_L	—	150 110	200 140	mA mA
Peak Load Current	I_P	$t=100\text{ ms}$ (single shot)	*	*	mA
Output Power Dissipation (continuous)	P_{DISS}	—	600	600	mW

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

Recommended Operating Conditions



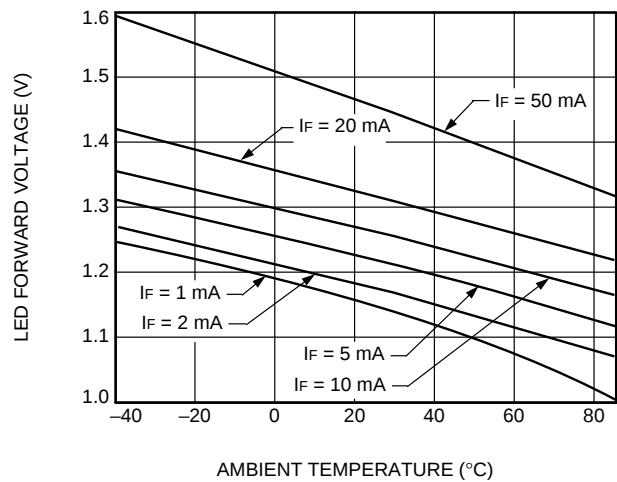
Electrical Characteristics $T_A=25^{\circ}\text{C}$

Minimum and maximum values are testing requirements. Typical values are characteristics of the device

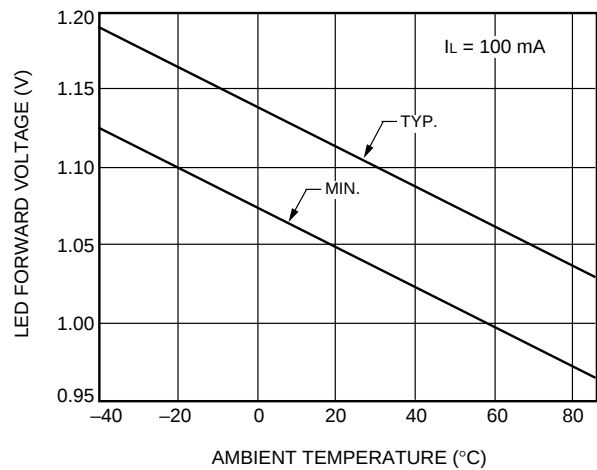
and are the result of engineering evaluations. Typical values are for information purposes only and are not part of the testing requirements.

	Parameter	Symbol	Test Conditions	Values	LH1503	LH1513	Units			
I N P U T	LED Forward Current for Switch Turn-on	I _{Fon}	I _L =100 mA t=10 ms	Min	—	—	mA			
				Typ	2.0	2.0	mA			
				Max	3.0	3.0	mA			
	LED Forward Current or Switch Turn-off	I _{Foff}	—	Min	0.2	0.2	mA			
				Typ	1.8	1.8	mA			
				Max	—	—	mA			
	LED Forward Voltage	V _F	I _F =10 mA	V _L	±	300	150	V		
				Min	1.15	1.15	V			
				Typ	1.26	1.26	V			
				Max	1.45	1.45	V			
O U T P U T	ON-resistance	R _{ON}	I _F =5 mA I _L =50 mA	Min	12	6	Ω			
				Typ	20	10	Ω			
				Max	25	15	Ω			
	Pole-to-pole ON-resistance Matching (S1 to S2)	—	I _F =5 mA I _L =50 mA	Min	—	—	ΔΩ			
				Typ	0.2	0.1	ΔΩ			
				Max	2.0	1.0	ΔΩ			
	OFF-resistance	R _{OFF}	I _F =0 mA V _L =±100 V	Min	0.5	0.5	GΩ			
				Typ	5000	5000	GΩ			
				Max	—	—	GΩ			
	Current Limit	I _{LMT}	I _F =5 mA t=5 ms	Min	230	300	mA			
				Typ	270	360	mA			
				Max	370	460	mA			
			V _L	±	6	5	V			
				Off-state Leakage Current	—	I _F =0 mA V _L =±100 V	Min	—	—	nA
							Typ	0.02	0.02	nA
	Max	200	200				nA			
			I _F =0 mA	Min	—	—	μA			
				Typ	—	—	μA			
				Max	1.0	1.0	μA			
			V _L	±	350	200	V			
				Output Capacitance	—	I _F =0 mA V _L =1 V	Min	—	—	pF
							Typ	55	60	pF
	Max	—	—				pF			
			I _F =0 mA V _L =50 V	Min	—	—	pF			
Typ				10	15	pF				
Max				—	—	pF				
Pole-to-pole Capacitance (S1 to S2)	—	I _F =0 mA	Min	—	—	pF				
			Typ	3.0	3.0	pF				
			Max	—	—	pF				
		I _F =5 mA	Min	—	—	pF				
			Typ	4.0	4.0	pF				
			Max	—	—	pF				
Switch Offset	—	I _F =5 mA	Min	—	—	μV				
			Typ	0.15	0.15	μV				
			Max	—	—	μV				
T R A N S F E R	Input/Output Capacitance	C _{ISO}	V _{ISO} =1 V	Min	—	—	pF			
				Typ	1.1	1.1	pF			
				Max	—	—	pF			
	Turn-on Time	t _{on}	I _F =10 mA I _L =50 mA	Min	—	—	ms			
				Typ	1.6	1.6	ms			
				Max	2.5	2.5	ms			
	Turn-off Time	t _{off}	I _F =10 mA I _L =50 mA	Min	—	—	ms			
				Typ	0.65	0.65	ms			
				Max	2.5	2.5	ms			

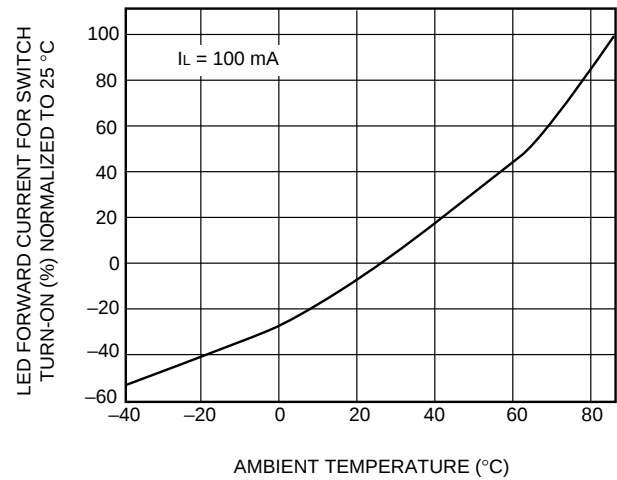
A. LED Voltage vs. Temperature



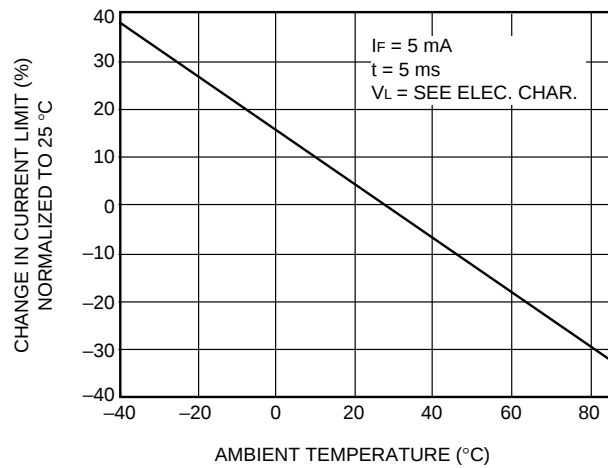
B. LED Dropout Voltage vs. Temperature



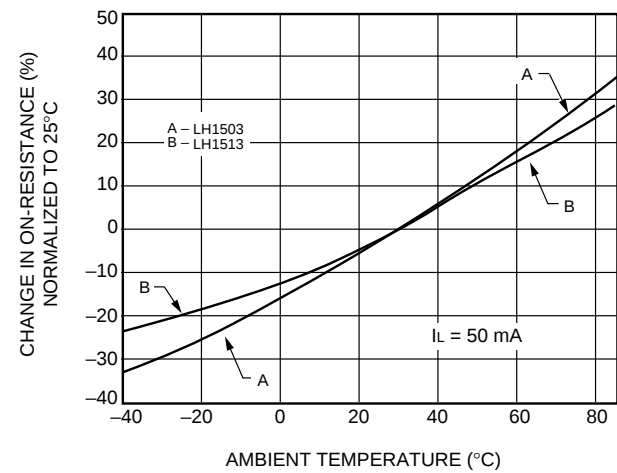
C. LED Current for Switch Turn-On vs. Temperature



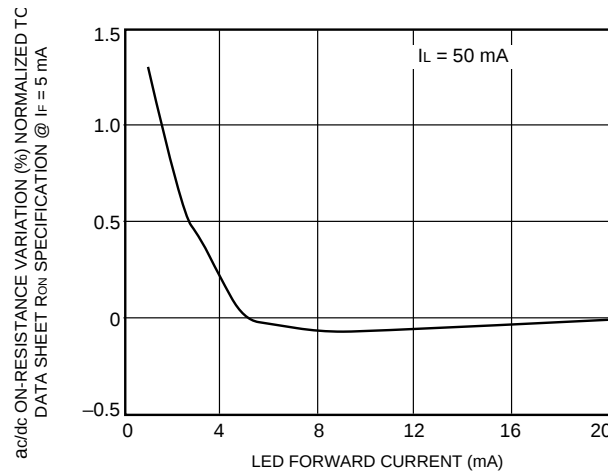
D. Current Limit vs. Temperature



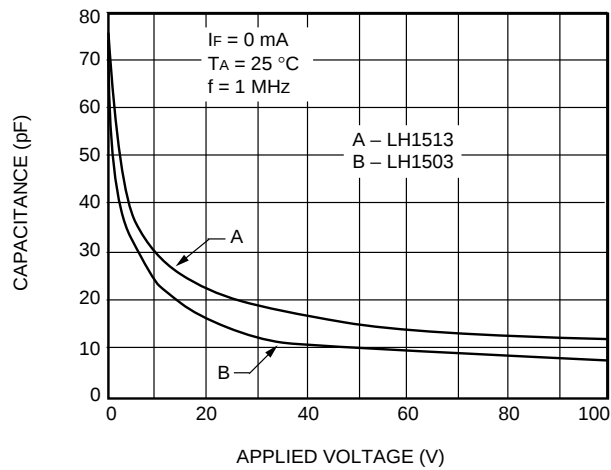
E. ON-Resistance vs. Temperature



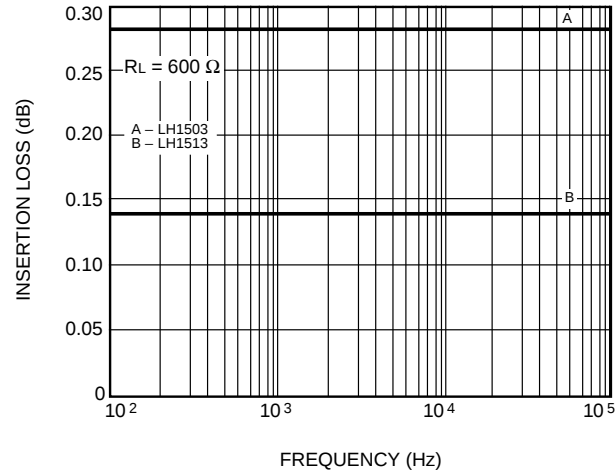
F. Variation in ON-Resistance vs. LED Current



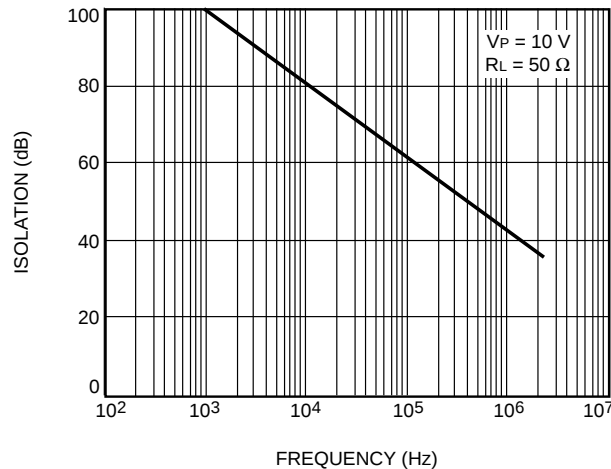
A. Switch Capacitance vs. Applied Voltage



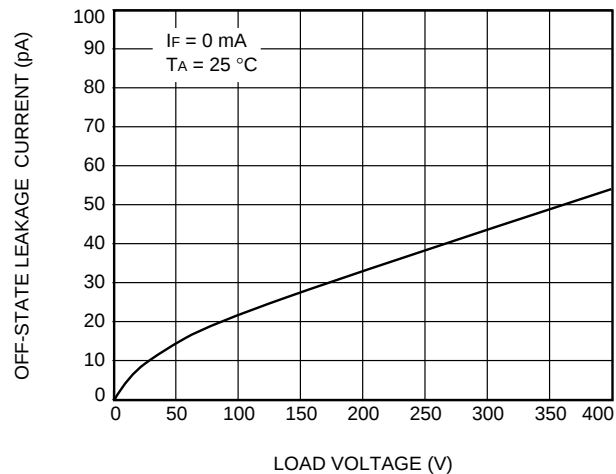
B. Insertion Loss vs. Frequency



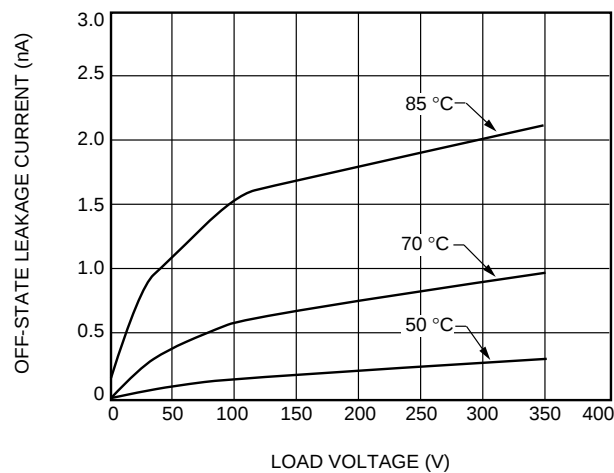
C. Output Isolation



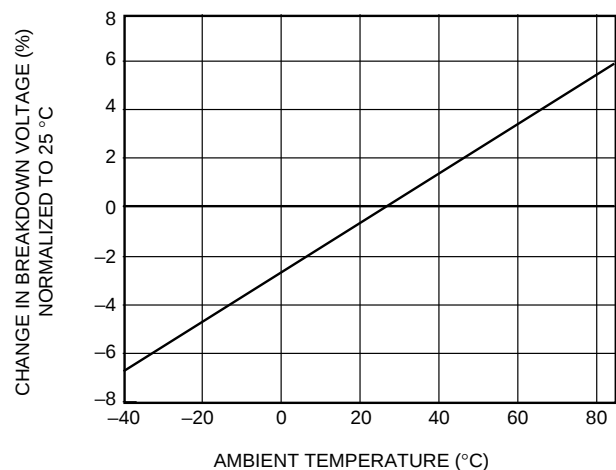
D. Leakage Current vs. Applied Voltage



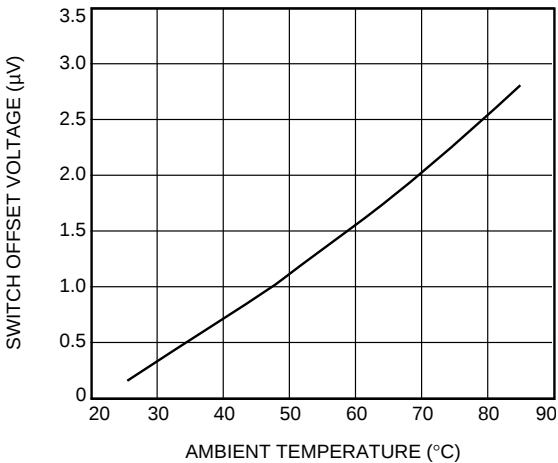
E. Leakage Current vs. Applied Voltage at Elevated Temperatures



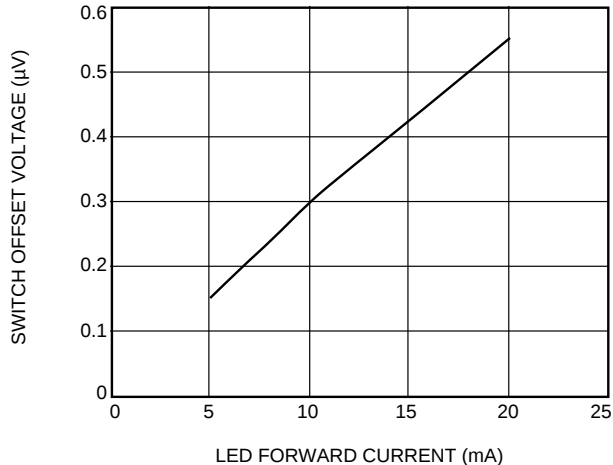
F. Switch Breakdown Voltage vs. Temperature



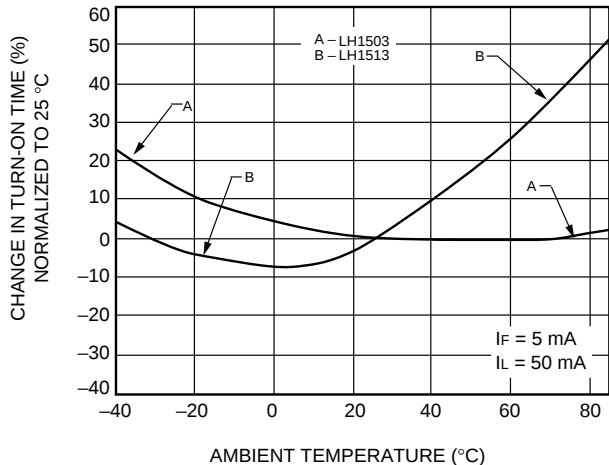
A. Switch Offset Voltage vs. Temperature



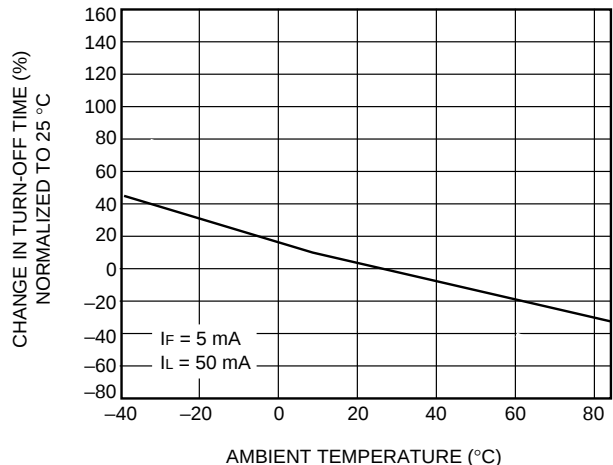
B. Switch Offset Voltage vs. LED Current



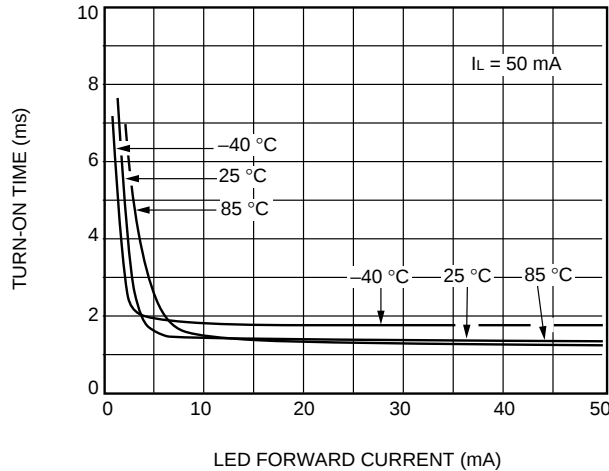
C. Turn-On Time vs. Temperature



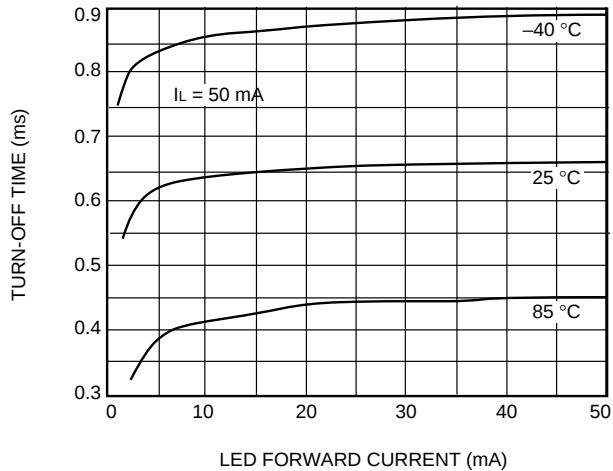
D. Turn-Off Time vs. Temperature



E. Turn-On Time vs. LED Current



F. Turn-Off Time vs. LED Current



Absolute Maximum Ratings $T_A=25^\circ\text{C}$

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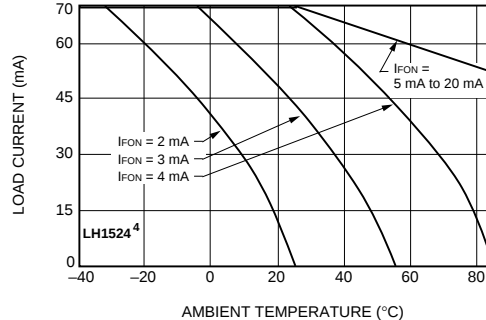
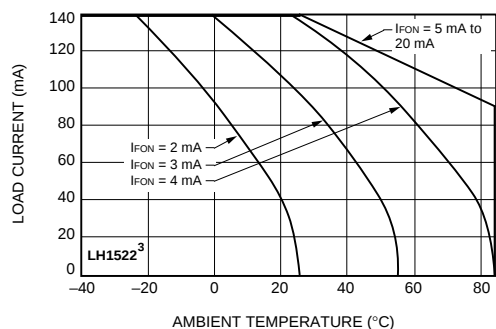
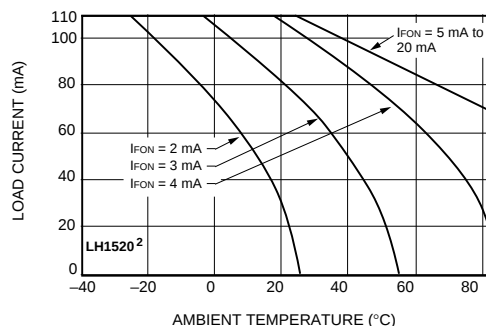
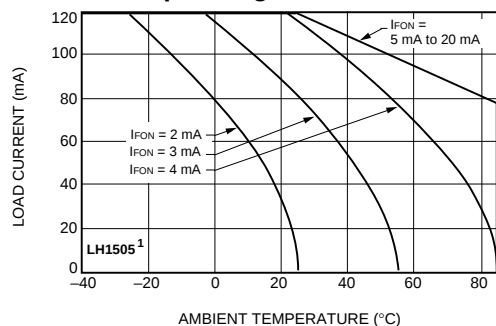
device is not implied at these or any other conditions in excess of those given in the operational sections of this document. Exposure to Absolute Maximum Ratings for extended periods of time can adversely affect reliability.

Parameter	Symbol	Test Conditions	LH1505	LH1520	LH1522	LH1524	Units
Ambient Operating Temperature Range	T_A	—	-40 to +85	-40 to +85	-40 to +85	-40 to + 85	$^\circ\text{C}$
Storage Temperature Range	T_{stg}	—	-40 to +150	-40 to +150	-40 to +150	-40 to +150	$^\circ\text{C}$
Pin Soldering Temperature	T_S	$t=10\text{ s max}$	260	260	260	260	$^\circ\text{C}$
Input/Output Isolation Test Voltage	V_{ISO}	$t=1\text{ s}$ $I_{\text{ISO}}=10\text{ }\mu\text{A max}$	5300	5300	5300	5300	V_{rms}
Pole-to-Pole Isolation Voltage (S1 to S2) [†]	—	Dry air, dust free, at sea level	1600	1600	1600	1600	V
LED Continuous Forward Current	I_F	—	50	50	50	50	mA
LED Reverse Voltage	V_R	$I_R \leq 10\text{ }\mu\text{A}$	8	8	8	8	V
dc or Peak ac Load Voltage	V_L	$I_L \leq 50\text{ }\mu\text{A}$	250	350	200	400	V
Continuous dc Load Current: One pole operating Two poles operating	I_L	—	130 120	150 110	200 140	95 70	mA mA
Peak Load Current	I_P	$t=100\text{ ms}$ (single shot)	*	*	*	*	mA
Output Power Dissipation (continuous)	P_{DISS}	—	600	600	600	600	mW

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

† Breakdown occurs between the output pins external to the package

Recommended Operating Conditions



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 purposes only and are not part of the testing requirements.

	Parameter	Symbol	Test Conditions	Values	LH1505	LH1520	LH1522	LH1524	Units	
I N P U T	LED Forward Current for Switch Turn-on	I _{Fon}	I _L =100 mA t=10 ms	Min	—	—	—	—	mA	
				Typ	1.0	1.0	1.0	0.5	mA	
				Max	2.0	2.0	2.0	2.0	mA	
	LED Forward Current for Switch Turn-off	I _{Foff}	—	Min	0.2	0.2	0.2	0.1	mA	
				Typ	0.9	1.1	1.1	0.4	mA	
				Max	—	—	—	—	mA	
	LED Forward Voltage	V _F	I _F =10 mA	V _L	±	200	300	150	350	V
				Min	1.15	1.15	1.15	1.15	V	
				Typ	1.26	1.26	1.26	1.26	V	
O U T P U T	ON-resistance	R _{ON}	I _F =5 mA I _L =50 mA	Min	10	12	6	12*	Ω	
				Typ	15	20	10	23*	Ω	
				Max	20	25	15	34*	Ω	
	OFF-resistance	R _{OFF}	I _F =0 mA V _L =±100 V	Min	0.5	0.5	0.5	0.5	GΩ	
				Typ	5000	5000	5000	5000	GΩ	
				Max	—	—	—	—	GΩ	
	ON-state Voltage	—	I _L =1 mA	Min	—	—	—	1.2	V	
				Typ	—	—	—	1.4	V	
				Max	—	—	—	1.8	V	
			I _L =90 mA t=10 ms	Min	—	—	—	3.0	V	
				Typ	—	—	—	3.6	V	
				Max	—	—	—	5.0	V	
	Current Limit	I _{LMT}	I _F =5 mA t=5 ms	Min	170	230	300	150	mA	
				Typ	200	270	360	210	mA	
				Max	280	370	460	270	mA	
	Off-state Leakage Current	—	I _F =0 mA V _L =±100 V	V _L	±	6	6	5	11	V
				Min	—	—	—	—	nA	
				Typ	0.02	0.02	0.02	0.02	nA	
			I _F =0 mA	Max	200	200	200	200	nA	
				Min	—	—	—	—	μA	
				Typ	—	—	—	—	μA	
	Output Capacitance	—	I _F =0 mA V _L =1 V	Max	1.0	1.0	1.0	1.0	μA	
				V _L	±	250	350	200	400	V
				Min	—	—	—	—	pF	
			I _F =0 mA V _L =50 V	Typ	55	55	60	2.5	pF	
				Max	—	—	—	—	pF	
				Min	—	—	—	—	pF	
Pole-to-pole Capacitance (S1 to S2)	—	I _F =5 mA	Typ	10	10	15	2.0	pF		
			Max	—	—	—	—	pF		
			Min	—	—	—	—	pF		
Switch Offset	—	I _F =5 mA	Typ	0.5	0.5	0.5	0.5	pF		
			Max	—	—	—	—	pF		
			Min	—	—	—	—	μV		
T R A N S F E R	Input/Output Capacitance	C _{ISO}	V _{ISO} =1 V	Typ	—	—	—	—	pF	
				Typ	1.1	1.1	1.1	1.1	pF	
				Max	—	—	—	—	pF	
	Turn-on Time	t _{on}	I _F =5 mA I _L =50 mA	Min	—	—	—	—	ms	
				Typ	1.4†	1.4	1.0‡	1.6	ms	
				Max	4.0†	2.0	2.0‡	5.0	ms	
	Turn-off Time	t _{off}	I _F =5 mA I _L =50 mA	Min	—	—	—	—	ms	
				Typ	0.7†	0.7	0.7‡	2.0	ms	
				Max	4.0†	2.0	2.0‡	5.0	ms	

* $R_{ON}=V(50\text{ mA}) - V(20\text{ mA})/30\text{ mA}$, $\dagger I_L=100\text{ mA}$, $\ddagger I_F=10\text{ mA}$.

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

- 1) Both relays on with equal load currents. For single relay operation, refer to the LH1518 Recommended Operating Conditions graph.
- 2) Both relays on with equal load currents. For single relay operation, refer to the LH1500 Recommended Operating Conditions graph.
- 3) Both relays on with equal load currents. For single relay operation, refer to the LH1510 Recommended Operating Conditions graph.
- 4) Both relays on with equal load currents. For single relay operation, refer to the LH1504 Recommended Operating Conditions graph.