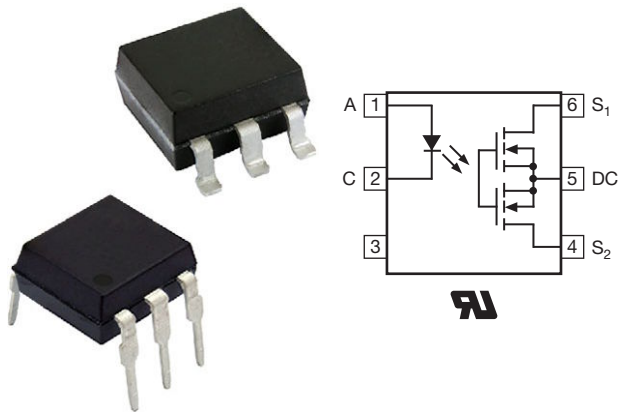


1 Form A Solid-State Relay (Normally Open)



DESCRIPTION

The LH1510 is an 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 high reliable MOSFETs for the output switch. In addition, it employs current-limiting circuitry to provide overvoltage protection. The LH1510 provides current limiting also for unidirectional DC applications.

FEATURES

- Isolation test voltage 5300 V_{RMS}
- Typical R_{ON} 12 Ω
- Load voltage 200 V
- Load current 200 mA / 350 mA
- Clean bounce free switching
- Current limit protection
- Low power consumption
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



APPLICATIONS

- General telecom switching
- Metering
- Security equipment
- Instrumentation
- Industrial controls
- Battery management systems
- Automatic test equipment

AGENCY APPROVALS

- UL1577, file no. E52744

ORDERING INFORMATION												
L	H	1	5	1	0	#	#	#	T	R		
PART NUMBER						ELECTR. VARIATION			PACKAGE CONFIG.		TAPE AND REEL	
PACKAGE						UL						
SMD-6, tubes						LH1510AAB						
SMD-6, tape and reel						LH1510AABTR						
DIP-6, tubes						LH1510AT						



ABSOLUTE MAXIMUM RATINGS ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)				
PARAMETER	CONDITION	SYMBOL	VALUE	UNIT
INPUT				
IRED continuous forward current		I_F	50	mA
IRED reverse voltage		V_R	5	V
Input power dissipation		P_{diss}	80	mW
OUTPUT				
DC or peak AC load voltage		V_L	200	V
Continuous load current (AC/DC configuration)		I_L	200	mA
Continuous load current (DC only configuration)		I_L	350	mA
SSR output power dissipation (continuous)		P_{diss}	550	mW
SSR				
Ambient temperature range		T_{amb}	-40 to +85	$^{\circ}\text{C}$
Storage temperature range		T_{stg}	-40 to +150	$^{\circ}\text{C}$
Soldering temperature	$t = 10\text{ s max.}$	T_{sld}	260	$^{\circ}\text{C}$

Note

- Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. 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 the time can adversely affect reliability

ELECTRICAL CHARACTERISTICS ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
INPUT						
IRED forward current, switch turn-on	$I_L = 100\text{ mA}$, $t = 10\text{ ms}$	I_{Fon}	-	0.4	2	mA
IRED forward current, switch turn-off	$V_L = \pm 200\text{ V}$	I_{Foff}	0.05	0.35	-	mA
IRED forward voltage	$I_F = 10\text{ mA}$	V_F	1.15	1.36	1.45	V
OUTPUT						
On-resistance (AC/DC configuration)	$I_F = 5\text{ mA}$, $I_L = 50\text{ mA}$	R_{ON}	6	12	15	Ω
On-resistance (DC only configuration)	$I_F = 5\text{ mA}$, $I_L = 100\text{ mA}$	R_{ON}	1.5	3.2	3.75	Ω
Off-resistance	$I_F = 0\text{ mA}$, $V_L = \pm 100\text{ V}$	R_{OFF}	0.5	5000	-	$\text{G}\Omega$
Off-state leakage current	$I_F = 0\text{ mA}$, $V_L = \pm 100\text{ V}$	I_O	-	< 1	200	nA
	$I_F = 0\text{ mA}$, $V_L = \pm 200\text{ V}$	I_O	-	< 1	1000	nA
Output capacitance (AC/DC configuration)	$I_F = 0\text{ mA}$, $V_L = 1\text{ V}$, 1 MHz	C_O	-	39	-	pF
	$I_F = 0\text{ mA}$, $V_L = 50\text{ V}$, 1 MHz	C_O	-	6	-	pF
Current limit (AC/DC configuration)	$I_F = 5\text{ mA}$, $t = 5\text{ ms}$, $V_L = \pm 6\text{ V}$	I_{limit}	300	440	550	mA
Current limit (DC only configuration)	$I_F = 5\text{ mA}$, $t = 5\text{ ms}$, $V_L = \pm 6\text{ V}$	I_{limit}	600	870	1100	mA
TRANSFER						
Capacitance (input to output)	$V_{IO} = 1\text{ V}$	C_{IO}	-	0.4	-	pF

Note

- 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

PIN CONFIGURATION



Fig. 1 - Pin Configuration

SWITCHING CHARACTERISTICS ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Turn-on time	$I_F = 5\text{ mA}$, $I_L = 50\text{ mA}$	t_{on}	-	0.20	2	ms
Turn-off time	$I_F = 5\text{ mA}$, $I_L = 50\text{ mA}$	t_{off}	-	0.03	2	ms



Fig. 2 - Timing Schematic

SAFETY AND INSULATION RATINGS				
PARAMETER	CONDITION	SYMBOL	VALUE	UNIT
Climatic classification	According to IEC 68 part 1		40 / 85 / 21	
Pollution degree	According to DIN VDE 0109		2	
Comparative tracking index	Insulation group IIIa	CTI	175	
Maximum rated withstanding isolation voltage	According to UL1577, $t = 1\text{ min}$	V_{ISO}	5300	V_{RMS}
Maximum transient isolation voltage	According to DIN EN 60747-5-5	V_{IOTM}	8000	V_{peak}
Maximum repetitive peak isolation voltage	According to DIN EN 60747-5-5	V_{IORM}	890	V_{peak}
Insulation resistance	$V_{IO} = 500\text{ V}$, $T_{amb} = 25\text{ }^{\circ}\text{C}$	R_{IO}	$\geq 10^{12}$	Ω
	$V_{IO} = 500\text{ V}$, $T_{amb} = 100\text{ }^{\circ}\text{C}$	R_{IO}	$\geq 10^{11}$	Ω
Output safety power		P_{SO}	700	mW
Input safety current		I_{SI}	240	mA
Safety temperature		T_S	175	$^{\circ}\text{C}$
Creepage distance			≥ 7	mm
Clearance distance			≥ 7	mm
Insulation thickness		DTI	≥ 0.4	mm
Input to output test voltage, method B	$V_{IORM} \times 1.875 = V_{PR}$, 100 % production test with $t_M = 1\text{ s}$, partial discharge $< 5\text{ pC}$	V_{PR}	1669	V_{peak}
Input to output test voltage, method A	$V_{IORM} \times 1.6 = V_{PR}$, 100 % sample test with $t_M = 10\text{ s}$, partial discharge $< 5\text{ pC}$	V_{PR}	1424	V_{peak}

Note

- As per IEC 60747-5-5, § 7.4.3.8.2, this optocoupler is suitable for "safe electrical insulation" only within the safety ratings. Compliance with the safety ratings shall be ensured by means of protective circuits

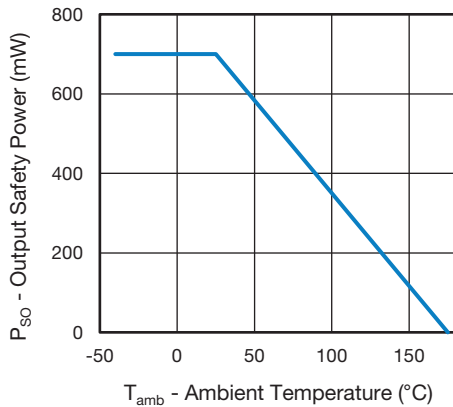


Fig. 3 - Output Safety Power vs. Ambient Temperature

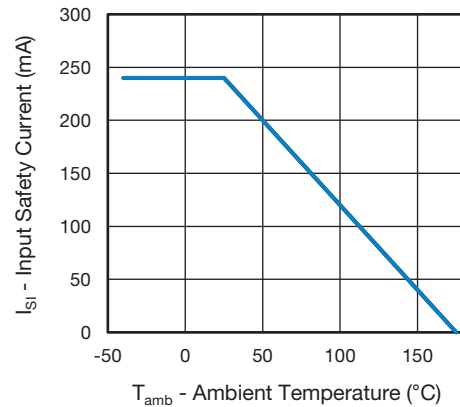


Fig. 4 - Input Safety Current vs. Ambient Temperature

TYPICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)

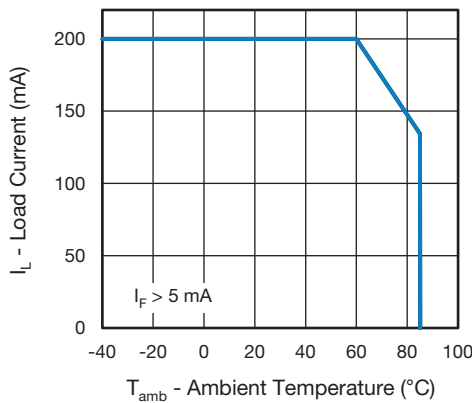


Fig. 5 - Load Current vs. Ambient Temperature

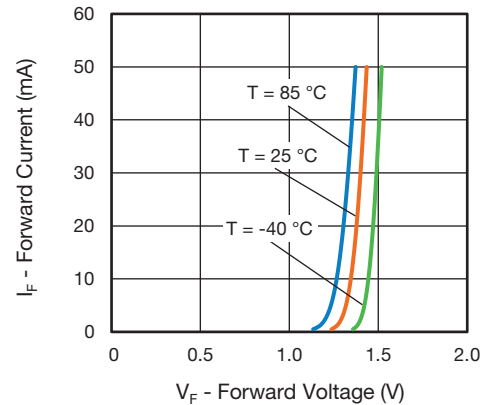


Fig. 7 - Forward Current vs. Forward Voltage

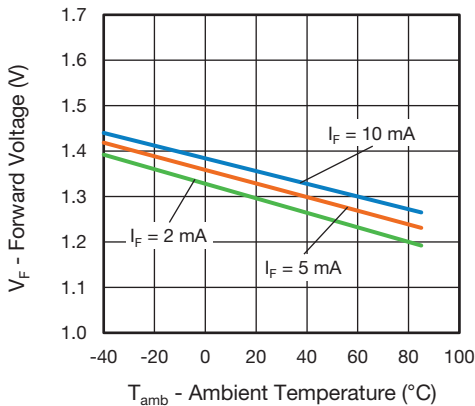


Fig. 6 - Forward Voltage vs. Ambient Temperature

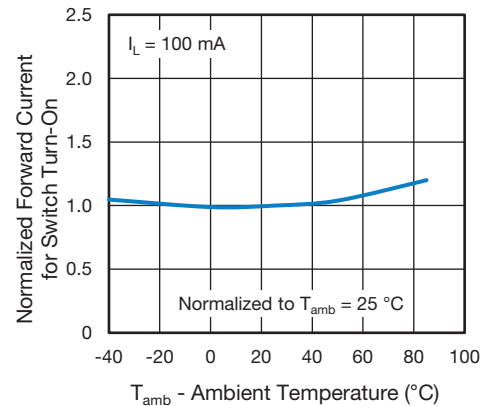


Fig. 8 - Normalized Forward Current for Switch Turn-On vs. Ambient Temperature

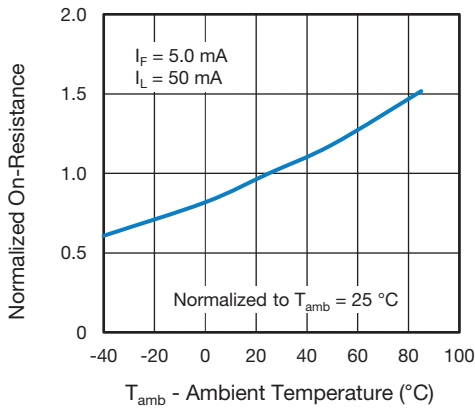


Fig. 9 - Normalized On-Resistance vs. Ambient Temperature

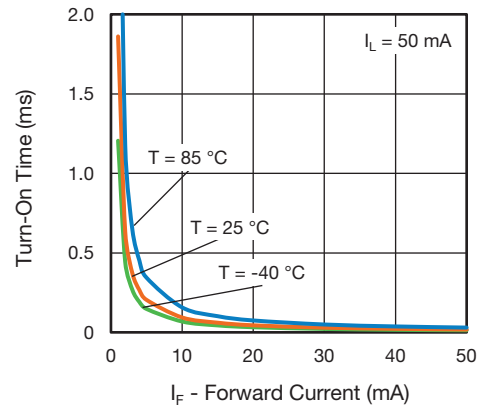


Fig. 12 - Turn-On Time vs. Forward Current

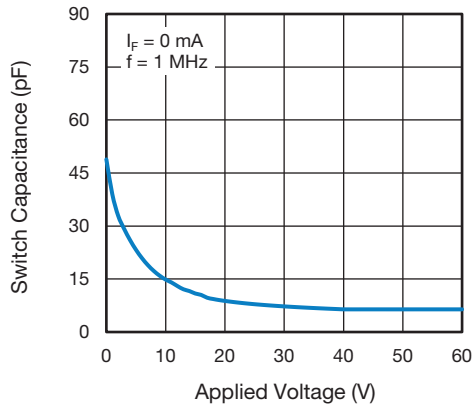


Fig. 10 - Switch Capacitance vs. Applied Voltage

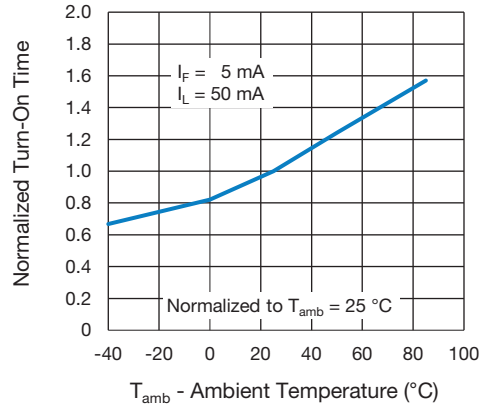


Fig. 13 - Normalized Turn-On Time vs. Ambient Temperature

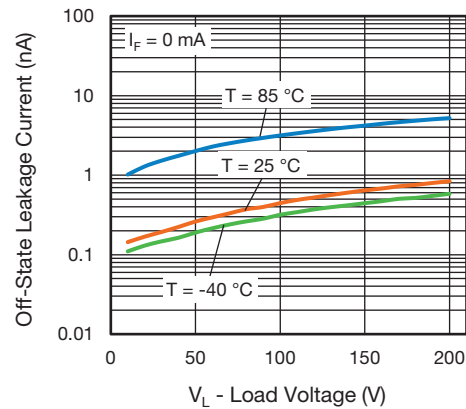


Fig. 11 - Off-State Leakage Current vs. Load Voltage

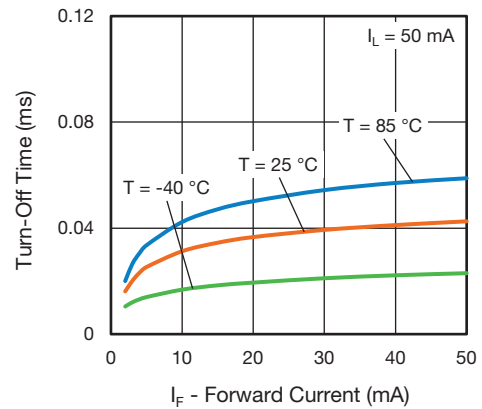


Fig. 14 - Turn-Off Time vs. Forward Current



Fig. 15 - Normalized Turn-Off Time vs. Ambient Temperature

PACKAGE DIMENSIONS (in millimeters)

SMD-6

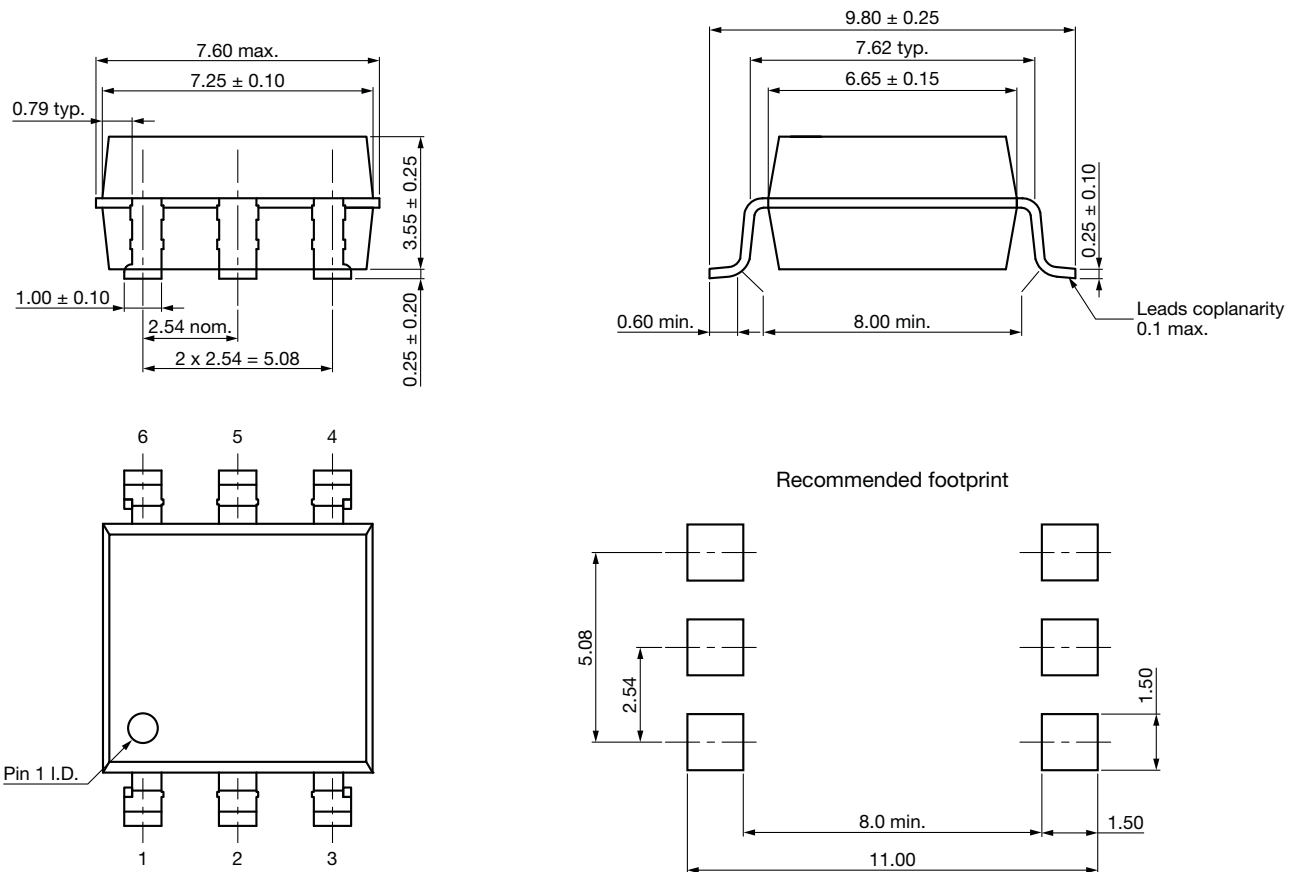


Fig. 16 - Package Drawings



DIP-6



Fig. 17 - Package Drawings

PACKAGE MARKING

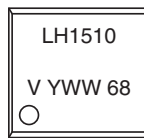


Fig. 18 - LH1510

Note

- Tape and reel suffix (TR) is not part of the package marking

PACKING INFORMATION (in millimeters)

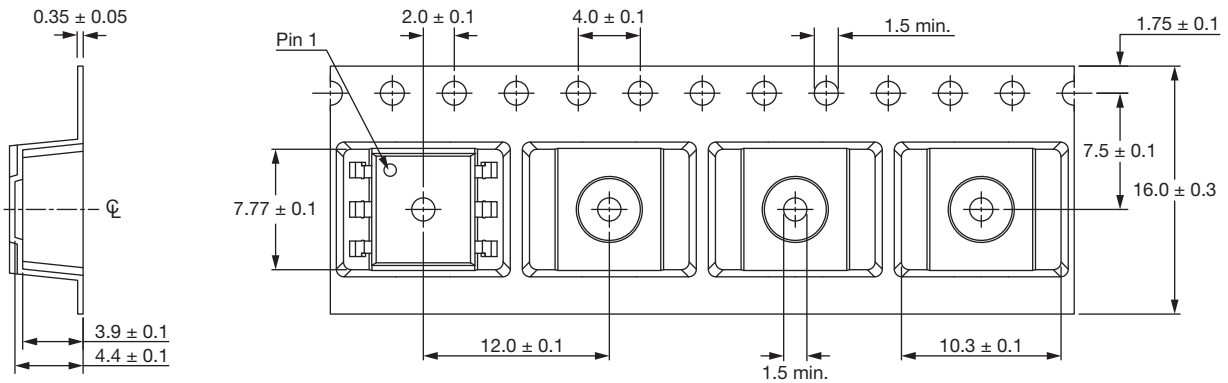
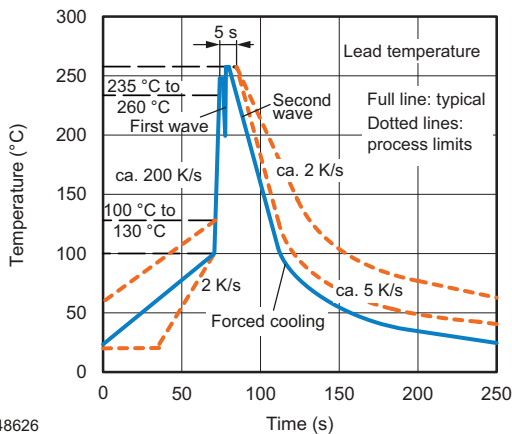


Fig. 19 - Tape and Reel Packing

TAPE AND REEL PACKING	
TYPE	UNITS/REEL
SMD-6	1000

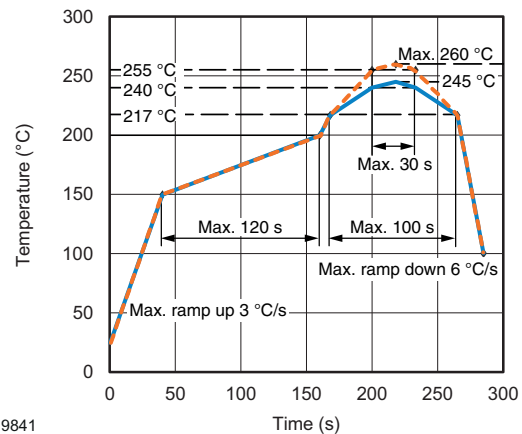
TUBE PACKING			
TYPE	UNITS/TUBE	TUBES/BOX	UNITS/BOX
SMD-6	50	40	2000
DIP-6	50	40	2000

SOLDER PROFILES



948626

Fig. 20 - Wave Soldering Double Wave Profile According to J-STD-020 for DIP Devices



19841

Fig. 21 - Lead (Pb)-free Reflow Solder Profile According to J-STD-020 for SMD Devices

HANDLING AND STORAGE CONDITIONS

ESD level: HBM class 2

Floor life: unlimited

Conditions: $T_{amb} < 30\text{ °C}$, RH < 60 %

Moisture sensitivity level 1, according to J-STD-020



Footprint and Schematic Information for LH1510AAB, LH1510AABTR, LH1510AT

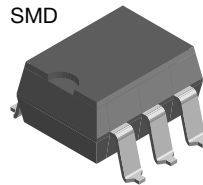
The footprint and schematic symbols for the following parts can be accessed using the associated links. They are available in Eagle, Altium, KiCad, OrCAD / Allegro, Pulsonix, and PADS.

Note that the 3D models for these parts can be found on the Vishay product page.

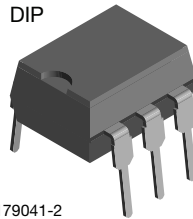
PART NUMBER	FOOTPRINT / SCHEMATIC
LH1510AAB	www.snapeda.com/parts/LH1510AAB/Vishay/view-part
LH1510AABTR	www.snapeda.com/parts/LH1510AABTR/Vishay/view-part
LH1510AT	www.snapeda.com/parts/LH1510AT/Vishay/view-part

For technical issues and product support, please contact optocoupleranswers@vishay.com.

SMD



DIP



i179041-2



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