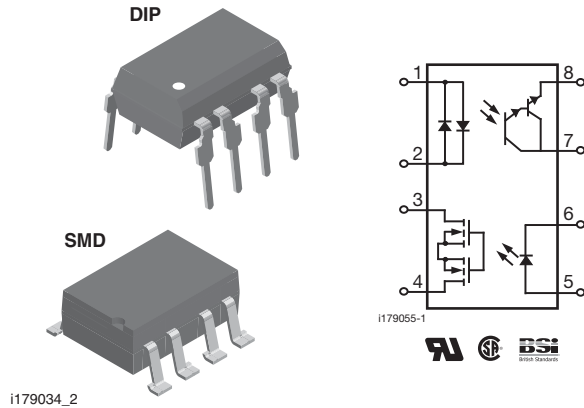


## 1 Form A Photo Darlington Telecom Switch



i179034\_2

### 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 switch hook and dial-pulse switching while the optocoupler performs ring detect and loop current sensing functions. Both the SSR and optocoupler provide 5300 V<sub>RMS</sub> 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 anti parallel 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.

### FEATURES

- Solid state relay and autopolarity optocoupler in one 8-pin package
- Isolation test voltage 5300 V<sub>RMS</sub>
- Surface mountable
- Optocoupler
  - Bidirectional current detection
  - High CTR:  $\geq 300\%$
- Solid state relay
  - Form A LH1525 type
  - Low operating current
  - Typical R<sub>ON</sub> 25  $\Omega$
  - Load voltage 400 V
  - Load current 120 mA
  - Current limit protection
  - Linear, AC/DC operation
  - Clean bounce free switching
  - Low power consumption
- Compliant to RoHS Directive 2002/95/EC and in accordance to WEEE 2002/96/EC



RoHS COMPLIANT

### APPLICATIONS

- General telecom switching
  - On/off hook switching
  - Dial pulse
  - Ring current detection
  - Loop current sensing

### AGENCY APPROVALS

UL1577: file no. E52744 system code H, double protection  
 CSA: certification no. 093751  
 BSI/BABT: certification no. 7980

ORDERING INFORMATION	
<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 2px 5px;">L</div> <div style="border: 1px solid black; padding: 2px 5px;">H</div> <div style="border: 1px solid black; padding: 2px 5px;">1</div> <div style="border: 1px solid black; padding: 2px 5px;">5</div> <div style="border: 1px solid black; padding: 2px 5px;">3</div> <div style="border: 1px solid black; padding: 2px 5px;">9</div> <div style="border: 1px solid black; padding: 2px 5px;">A</div> <div style="border: 1px solid black; padding: 2px 5px;">#</div> <div style="border: 1px solid black; padding: 2px 5px;">#</div> <div style="border: 1px solid black; padding: 2px 5px;">T</div> <div style="border: 1px solid black; padding: 2px 5px;">R</div> </div> <p style="text-align: center; margin-top: 5px;"> <span style="margin-right: 100px;">PART NUMBER</span> <span style="margin-right: 100px;">ELECTR. VARIATION</span> <span style="margin-right: 100px;">PACKAGE CONFIG.</span> <span style="margin-right: 100px;">TAPE AND REEL</span> </p>	
<b>PACKAGE</b>	<b>UL, CSA, BSI</b>
SMD-8, gullwing, tubes	LH1539AAC
SMD-8, gullwing, tape and reel	LH1539AACTR
DIP-8, tubes	LH1539AB

# LH1539AAC, LH1539AACTR, LH1539AB



Vishay Semiconductors 1 Form A Photo Darlington Telecom Switch

ABSOLUTE MAXIMUM RATINGS ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
<b>SSR</b>				
<b>INPUT</b>				
LED continuous forward current		$I_F$	50	mA
LED reverse voltage	$I_R \leq 10\text{ }\mu\text{A}$	$V_R$	8	V
<b>OUTPUT</b>				
DC or peak AC load voltage	$I_L \leq 50\text{ }\mu\text{A}$	$V_L$	400	V
Continuous DC load current		$I_L$	120	mA
<b>SSR</b>				
Ambient operating temperature range		$T_{amb}$	- 40 to + 85	$^{\circ}\text{C}$
Storage temperature range		$T_{stg}$	- 40 to + 85	$^{\circ}\text{C}$
Pin soldering temperature <sup>(1)</sup>	$t = 10\text{ s max.}$	$T_{sld}$	260	$^{\circ}\text{C}$
Input to output isolation voltage	$t = 60\text{ s min.}$	$V_{ISO}$	5300	$V_{RMS}$
Package power dissipation (continuous)		$P_{diss}$	600	mW
<b>OPTOCOUPLER</b>				
<b>INPUT</b>				
LED continuous forward current		$I_F$	50	mA
LED reverse voltage	$I_R \leq 10\text{ }\mu\text{A}$	$V_R$	3	V
<b>OUTPUT</b>				
Collector emitter breakdown voltage		$BV_{CEO}$	30	V
Phototransistor power dissipation		$P_{diss}$	150	mW

## Notes

- 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.

<sup>(1)</sup> Refer to reflow profile for soldering conditions for surface mounted devices (SMD). Refer to wave profile for soldering conditions for through hole devices (DIP).

ELECTRICAL CHARACTERISTICS ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
<b>INPUT</b>						
LED forward current, switch turn-on	$I_L = 100\text{ mA}$ , $t = 10\text{ ms}$	$I_{Fon}$		0.5	1	mA
LED forward current, switch turn-off	$V_L = \pm 300\text{ V}$	$I_{Foff}$	0.1	0.4		mA
LED forward voltage	$I_F = 3\text{ mA}$	$V_F$	0.8	1.2	1.4	V
<b>OUTPUT</b>						
On-resistance	$I_F = 3\text{ mA}$ , $I_L = \pm 50\text{ mA}$	$R_{ON}$	17	25	33	$\Omega$
Off-resistance	$I_F = 0\text{ mA}$ , $V_L = \pm 100\text{ V}$	$R_{OFF}$		5000		G $\Omega$
Current limit	$I_F = 5\text{ mA}$ , $t = 5\text{ ms}$	$I_{LMT}$	170	210	270	mA
Off-state leakage current	$I_F = 0\text{ mA}$ , $V_L = \pm 100\text{ V}$	$I_O$		0.04	100	nA
Capacitance pin 4 to pin 6	$I_F = 0\text{ mA}$ , $V_L = 1\text{ V}$	$C_O$		55		pF
	$I_F = 0\text{ mA}$ , $V_L = 50\text{ V}$	$C_O$		10		pF
<b>TRANSFER</b>						
Optocoupler						
LED forward voltage	$I_F = 10\text{ mA}$	$V_F$	0.9	1.2	1.5	V
DC current transfer ratio	$I_F = 0.05\text{ mA}$ , $V_{CE} = 0.9\text{ V}$	$CTR_{DC}$	300			%
Saturation voltage	$I_F = 0.05\text{ mA}$ , $I_C = 0.15\text{ mA}$	$V_{CEsat}$			1	V
Collector emitter leakage current	$I_F = 0\text{ mA}$ , $V_{CE} = 5\text{ V}$	$I_{CEO}$			N/A	

## 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.

SWITCHING CHARACTERISTICS ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Turn-on time	$I_F = 5\text{ mA}$ , $I_L = 50\text{ mA}$	$t_{on}$			2	ms
Turn-off time	$I_F = 5\text{ mA}$ , $I_L = 50\text{ mA}$	$t_{off}$			0.5	ms

RECOMMENDED OPERATING CONDITIONS						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
LED forward current, switch turn-on	$T_{amb} = - 40\text{ }^{\circ}\text{C}$ to + 85 $^{\circ}\text{C}$	$I_{Fon}$	3		20	mA



# LH1539AAC, LH1539AACTR, LH1539AB

1 Form A Photo Darlington Telecom Vishay Semiconductors Switch

## TYPICAL CHARACTERISTICS ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)

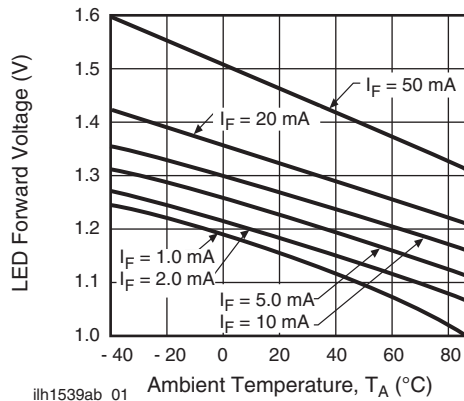


Fig. 1 - LED Voltage vs. Temperature

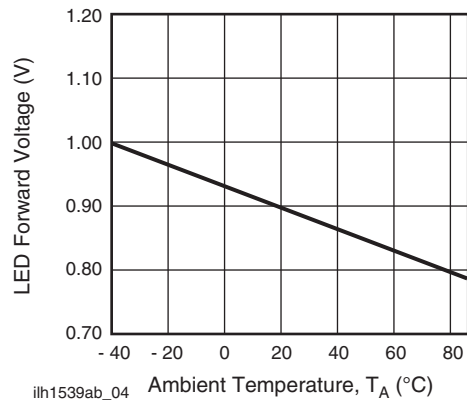


Fig. 4 - LED Dropout Voltage vs. Temperature

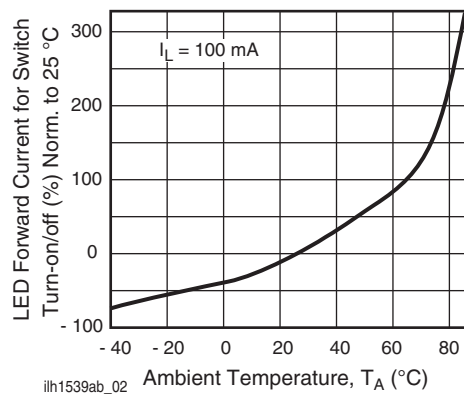


Fig. 2 - LED Current for Switch Turn-on/off vs. Temperature

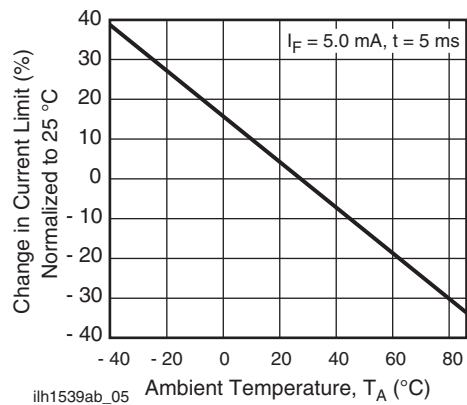


Fig. 5 - Current Limit vs. Temperature

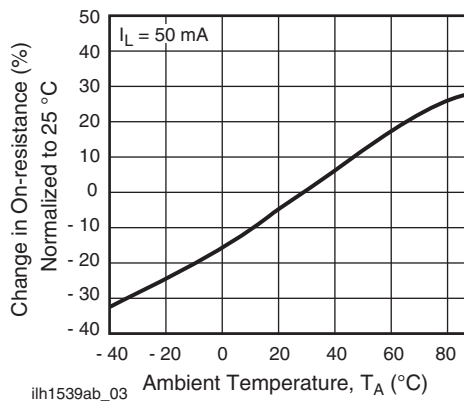


Fig. 3 - On-Resistance vs. Temperature

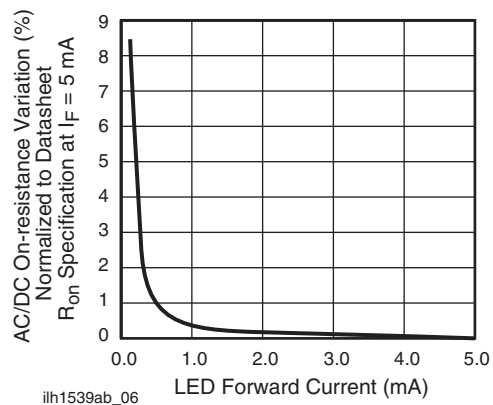
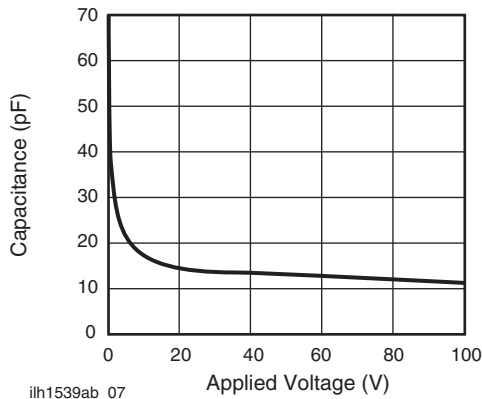


Fig. 6 - Variation in On-Resistance vs. LED Current

# LH1539AAC, LH1539AACTR, LH1539AB

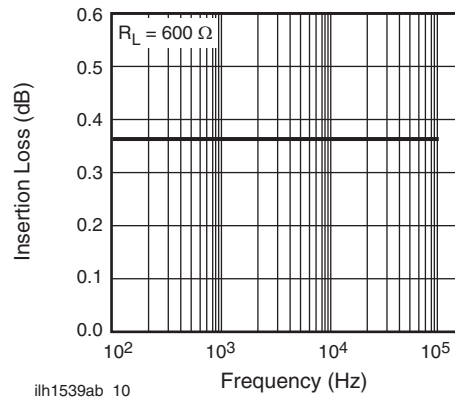


Vishay Semiconductors 1 Form A Photo Darlington Telecom Switch



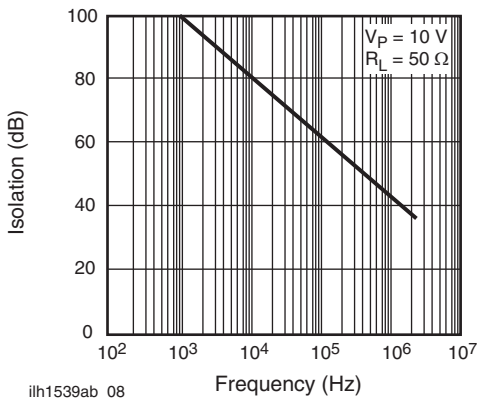
ilh1539ab\_07

Fig. 7 - Output Isolation



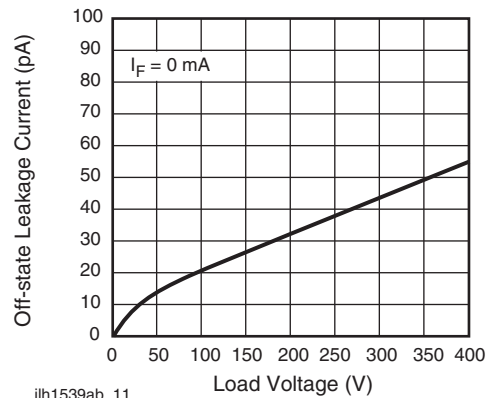
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Fig. 10 - Insertion Loss vs. Frequency



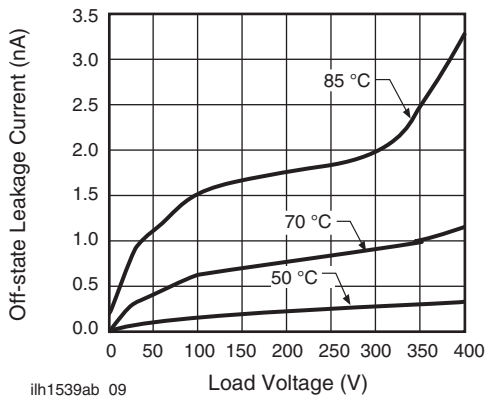
ilh1539ab\_08

Fig. 8 - Output Isolation



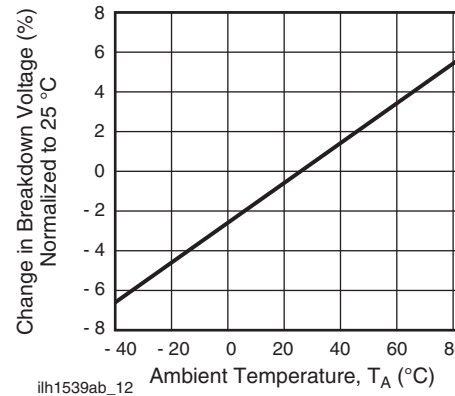
ilh1539ab\_11

Fig. 11 - Leakage Current vs. Applied Voltage



ilh1539ab\_09

Fig. 9 - Leakage Current vs. Applied Voltage at Elevated Temperatures



ilh1539ab\_12

Fig. 12 - Switch Breakdown Voltage vs. Temperature

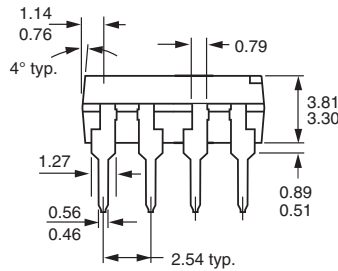
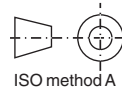
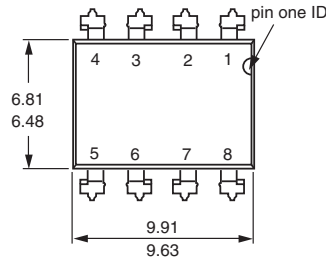


# LH1539AAC, LH1539AACTR, LH1539AB

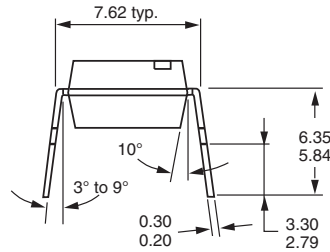
1 Form A Photo Darlington Telecom Vishay Semiconductors Switch

## PACKAGE DIMENSIONS in millimeters

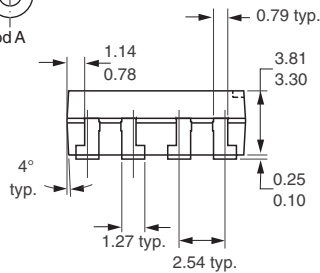
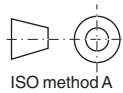
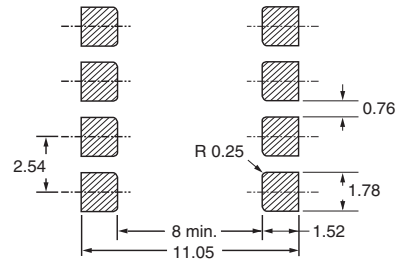
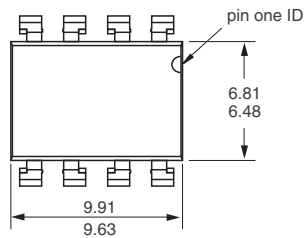
DIP



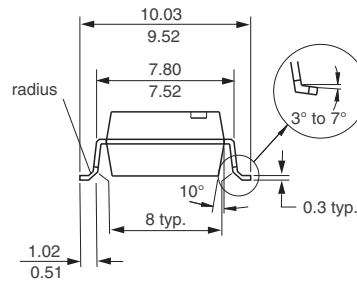
i178008



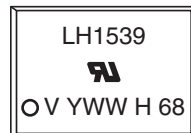
SMD



i178009



## PACKAGE MARKING (example)



### Note

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



## Disclaimer

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