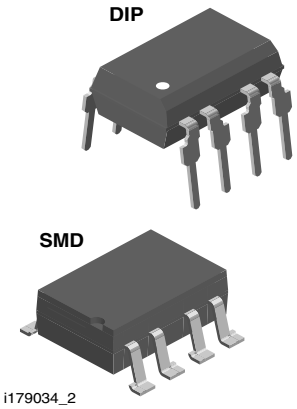
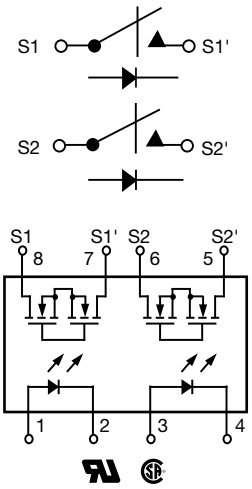
# Dual 1 Form A Solid-State Relay




## FEATURES

- Dual channel (LH1546)
- Current limit protection
- Isolation test voltage 5300 $V_{RMS}$
- Typical $R_{ON}$ 28 Ω
- Load voltage 350 V
- Load current 120 mA
- High surge capability
- Clean bounce free switching
- Low power consumption
- SMD lead available on tape and reel
- Material categorization: For definitions of compliance please see www.vishay.com/doc?99912

Pb-free

e3

RoHS COMPLIANT

## DESCRIPTION

The LH1556 dual 1 form A relays are SPST normally open switches that can replace electromechanical relays in many applications. They are 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 circuitry, and MOSFET switches. In addition, the LH1556 SSRs employ current-limiting circuitry, enabling them to pass lightning surge testing as per ANSI/TIA-968-B and other regulatory surge requirements when overvoltage protection is provided.

## APPLICATIONS

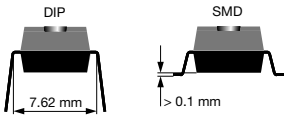
- General telecom switching
  - On/off hook control
  - Ring relay
  - Dial pulse
  - Ground start
  - Ground fault protection
- Instrumentation
- Industrial controls

## AGENCY APPROVALS

- UL1577 file no. E52744 system code H, double protection
- CSA certification no. 093751

## ORDERING INFORMATION

| L | H | 1 | 5 | 5 | 6 | A | # | # | T | R |
|---|---|---|---|---|---|---|---|---|---|---|
| PART NUMBER | | | | | | ELECTR. VARIATION | PACKAGE CONFIG. | | TAPE AND REEL | |




| PACKAGE | UL, CSA |
|---|---|
| SMD-8, tubes | LH1556AAC |

| **ABSOLUTE MAXIMUM RATINGS** ($T_{amb}$ = 25 °C, unless otherwise specified) | | | | |
|---|---|---|---|---|
| **PARAMETER** | **TEST CONDITION** | **SYMBOL** | **VALUE** | **UNIT** |
| **INPUT** | | | | |
| LED continuous forward current | | $I_F$ | 50 | mA |
| LED reverse voltage | $I_R \leq 10$ µA | $V_R$ | 8.0 | V |
| **OUTPUT** | | | | |
| DC or peak AC load voltage | $I_L \leq 50$ µA | $V_L$ | 350 | V |
| Continuous DC load current, one pole operating | | $I_L$ | 120 | mA |
| Continuous DC load current, two poles operating | | $I_L$ | 110 | mA |
| **SSR** | | | | |
| Peak load current (single shot) | t = 100 ms | $I_P$ | (1) | mA |
| Ambient temperature range | | $T_{amb}$ | -40 to +85 | °C |
| Storage temperature range | | $T_{stg}$ | -40 to +150 | °C |
| Pin soldering temperature (2) | t = 10 s max. | $T_{sld}$ | 260 | °C |
| Input to output isolation voltage | | $V_{ISO}$ | 5300 | $V_{RMS}$ |
| Output power dissipation (continuous) | | $P_{diss}$ | 550 | 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.

(1) Refer to current limit performance application note for a discussion on relay operation during transient currents.

| **ELECTRICAL CHARACTERISTICS** ($T_{amb}$ = 25 °C, unless otherwise specified) | | | | | | |
|---|---|---|---|---|---|---|
| **PARAMETER** | **TEST CONDITION** | **SYMBOL** | **MIN.** | **TYP.** | **MAX.** | **UNIT** |
| **INPUT** | | | | | | |
| LED forward current, switch turn-on | $I_L$ = 100 mA, t = 10 ms | $I_{Fon}$ | | 1.1 | 2.0 | mA |
| LED forward current, switch turn-off | $V_L$ = ± 350 V | $I_{Foff}$ | 0.2 | 1.0 | | mA |
| LED forward voltage | $I_F$ = 10 mA | $V_F$ | 1.15 | 1.26 | 1.45 | V |
| **OUTPUT** | | | | | | |
| On-resistance AC/DC: pin 4 (±) to 6 (±) | $I_F$ = 5.0 mA, $I_L$ = 50 mA | $R_{ON}$ | | 28 | 35 | Ω |
| On-resistance DC: pin 4, 6 (+) to 5 (-) | $I_F$ = 5.0 mA, $I_L$ = 100 mA | $R_{ON}$ | | 7.0 | 10 | Ω |
| Off-resistance | $I_F$ = 0 mA, $V_L$ = ± 100 V | $R_{OFF}$ | 0.5 | 300 | | GΩ |
| Current limit AC/DC | $I_F$ = 5.0 mA, $V_L$ = ± 6.0 V, t = 5.0 ms | $I_{LMT}$ | 170 | 210 | 250 | mA |
| Off-state leakage current | $I_F$ = 0 mA, $V_L$ = ± 100 V | $I_O$ | | 0.35 | 200 | nA |
| | $I_F$ = 0 mA, $V_L$ = ± 350 V | $I_O$ | | 0.096 | 1.0 | µA |
| Output capacitance pin 4 to 6 | $I_F$ = 0 mA, $V_L$ = 1.0 V | $C_O$ | | 18 | | pF |
| | $I_F$ = 0 mA, $V_L$ = 50 V | $C_O$ | | 6.7 | | pF |
| Switch offset | $I_F$ = 5.0 mA | $V_{OS}$ | | 0.3 | | µV |
| **TRANSFER** | | | | | | |
| Capacitance (input to output) | $V_{ISO}$ = 1.0 V | $C_{IO}$ | | 0.67 | | 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.

| **SWITCHING CHARACTERISTICS** ($T_{amb}$ = 25 °C, unless otherwise specified) | | | | | | |
|---|---|---|---|---|---|---|
| **PARAMETER** | **TEST CONDITION** | **SYMBOL** | **MIN.** | **TYP.** | **MAX.** | **UNIT** |
| Turn-on time | $I_F$ = 5.0 mA, $I_L$ = 50 mA | $t_{on}$ | | 1.14 | 3.0 | ms |
| Turn-off time | $I_F$ = 5.0 mA, $I_L$ = 50 mA | $t_{off}$ | | 0.71 | 3.0 | ms |

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

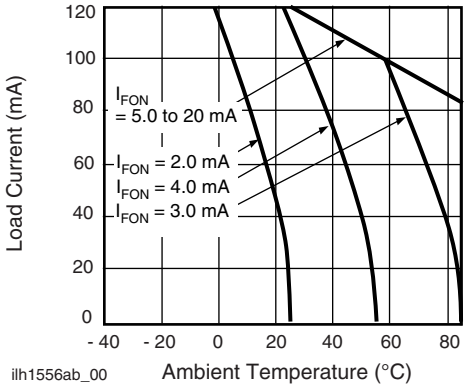



Fig. 1 - Recommended Operating Conditions

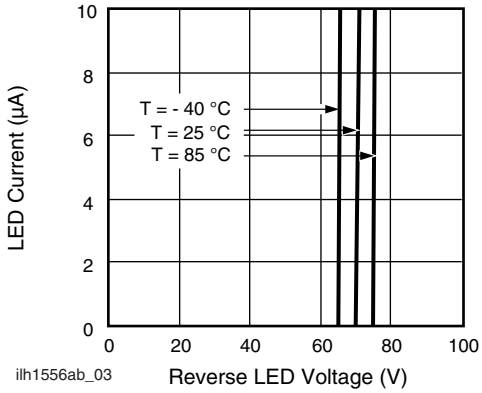



Fig. 4 - LED Reverse Current vs. LED Reverse Voltage

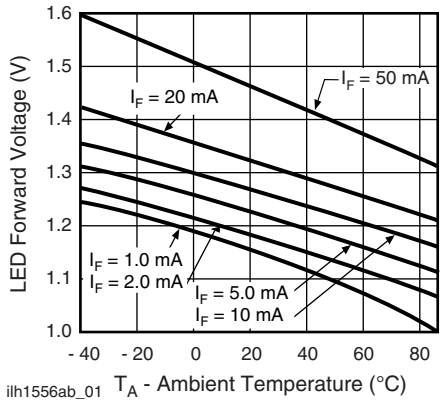



Fig. 2 - LED Voltage vs. Temperature

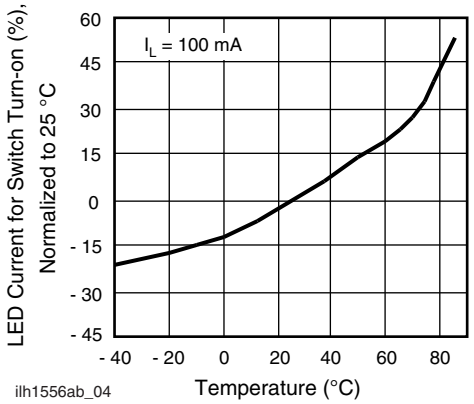



Fig. 5 - LED Current for Switch Turn-on vs. Temperature

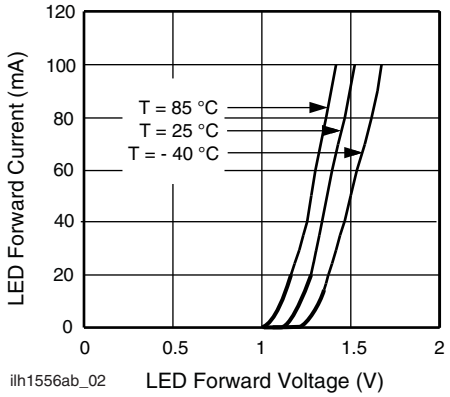



Fig. 3 - LED Forward Current vs. LED Forward Voltage

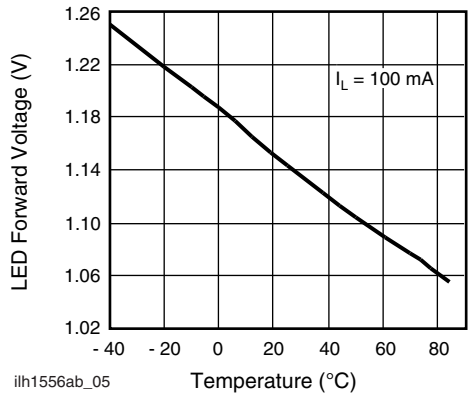



Fig. 6 - LED Dropout Voltage vs. Temperature

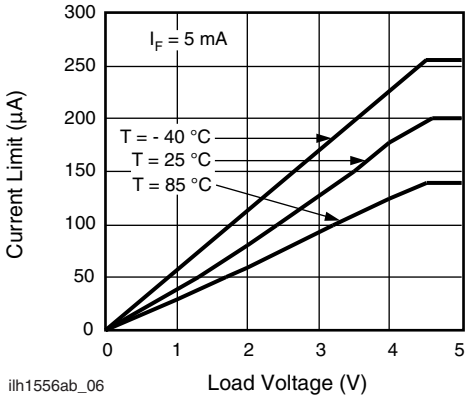



Fig. 7 - Load Current vs. Load Voltage

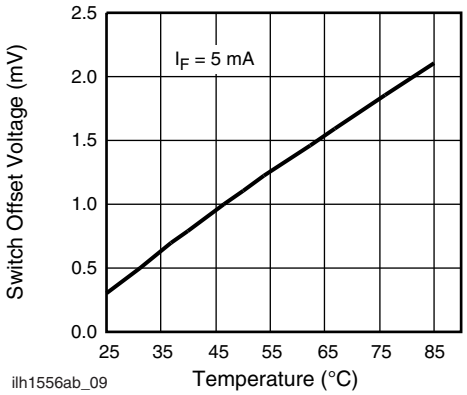



Fig. 10 - Switch Offset Voltage vs. LED Current

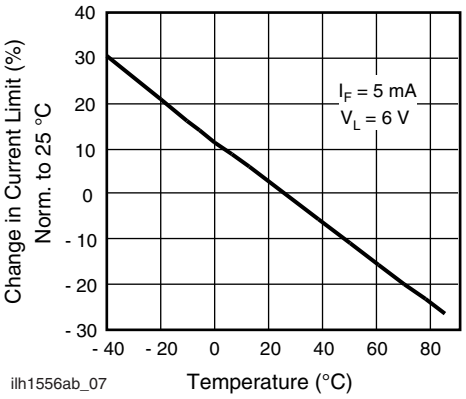



Fig. 8 - Current Limit vs. Temperature

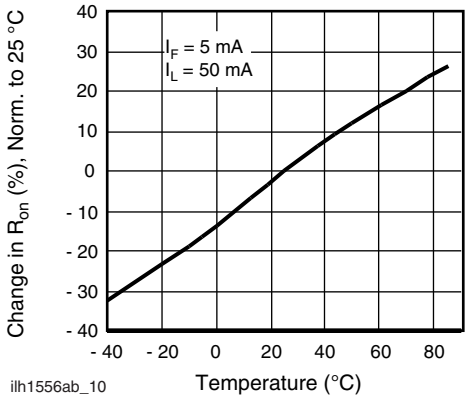



Fig. 11 - On-Resistance vs. Temperature

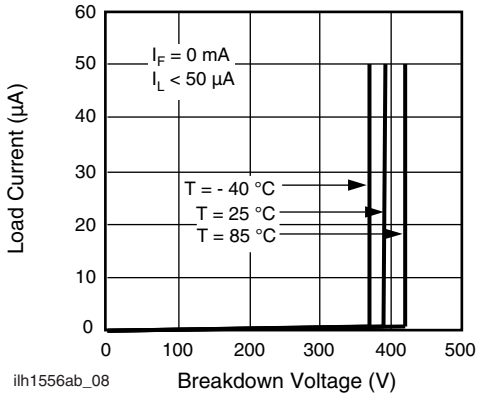



Fig. 9 - Switch Breakdown Voltage vs. Load Current

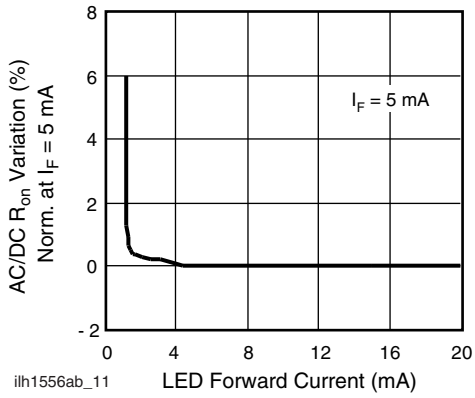



Fig. 12 - Variation in On-Resistance vs. LED Current

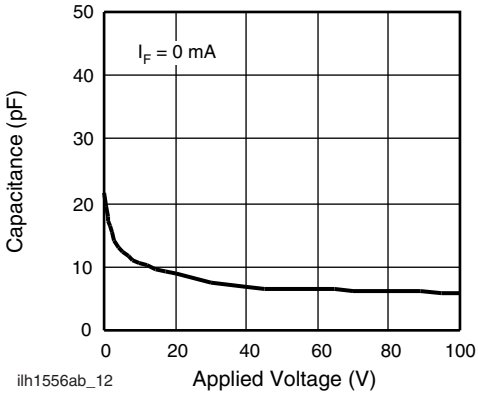



Fig. 13 - Switch Capacitance vs. Applied Voltage

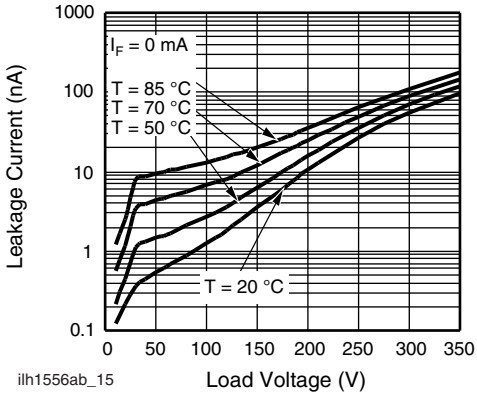



Fig. 16 - Leakage Current vs.
Applied Voltage at Elevated Temperatures

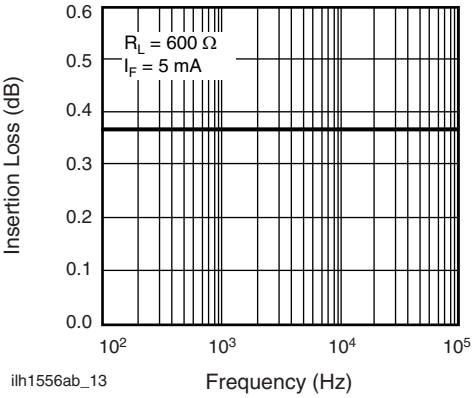



Fig. 14 - Insertion Loss vs. Frequency

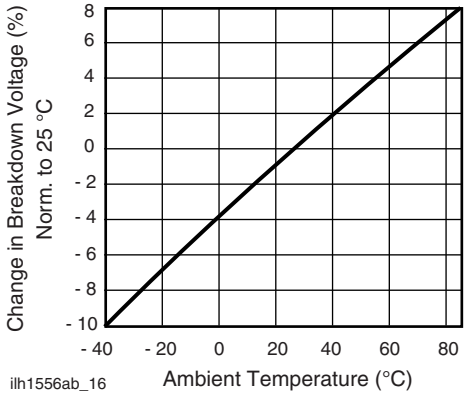



Fig. 17 - Switch Breakdown Voltage vs. Temperature

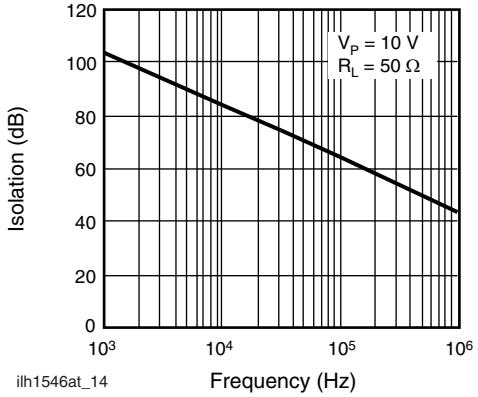



Fig. 15 - Output Isolation

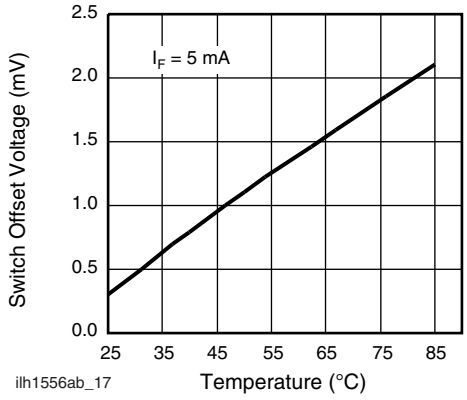



Fig. 18 - Switch Offset Voltage vs. Temperature

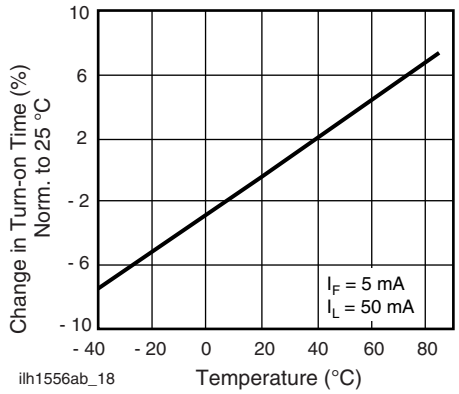



Fig. 19 - Turn-on Time vs. Temperature

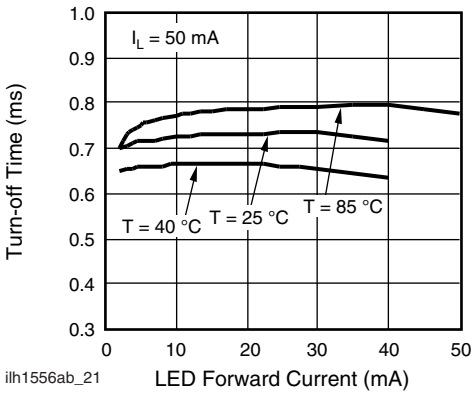



Fig. 22 - Turn-off Time vs. LED Current

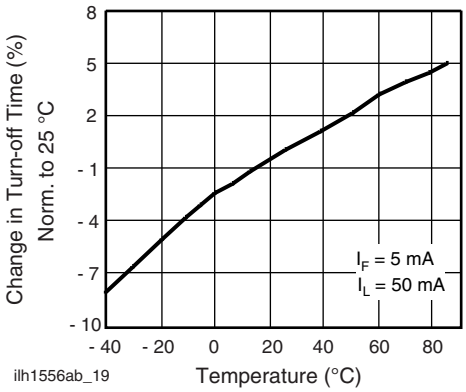



Fig. 20 - Turn-off Time vs. Temperature

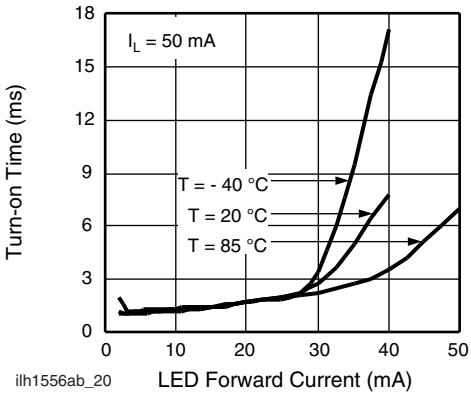
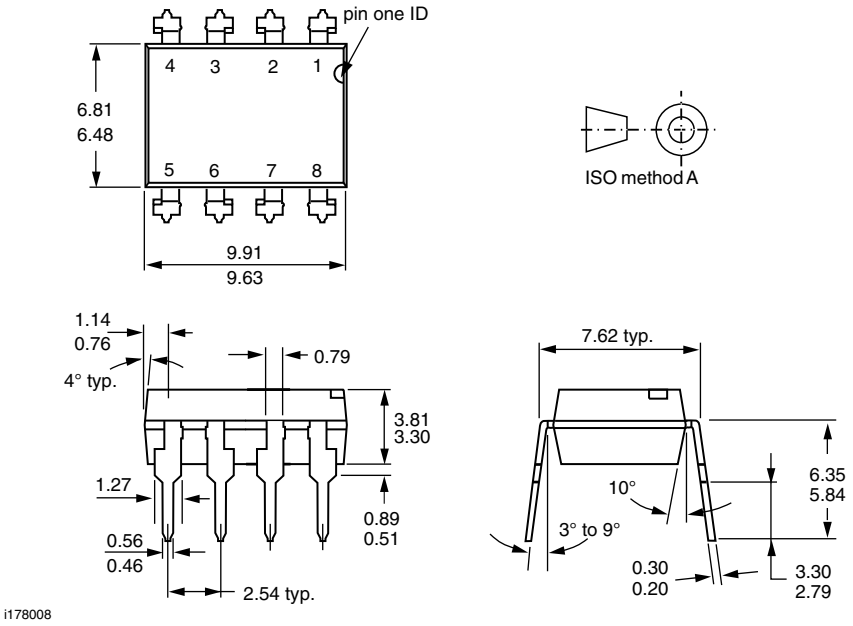


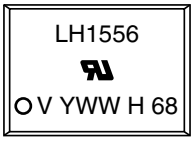

Fig. 21 - Turn-on Time vs. LED Current

## PACKAGE DIMENSIONS in millimeters

DIP




## PACKAGE MARKING (Example)




**Note**

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

# Footprint and Schematic Information for LH1556AAC, LH1556AACTR, LH1556AB

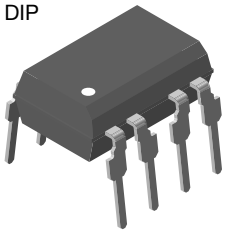
The footprint and schematic symbols for the following parts can be accessed using the associated links. They are available in Eagle, Altium, KiCad, OrCAD / Allegro, Pulsonix, and PADS.

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

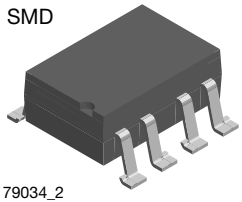
| PART NUMBER | FOOTPRINT / SCHEMATIC |
|---|---|
| LH1556AAC | www.snapeda.com/parts/LH1556AAC/Vishay/view-part |
| LH1556AACTR | www.snapeda.com/parts/LH1556AACTR/Vishay/view-part |
| LH1556AB | www.snapeda.com/parts/LH1556AB/Vishay/view-part |

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

DIP



SMD



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