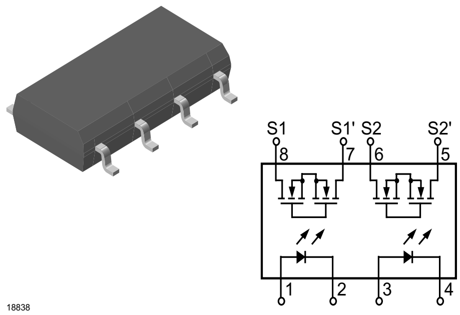
# Dual 1 Form A Solid State Relay

## Features

- Solid-state Relay (Equivalent to AQW210S)
  - Typical $R_{ON}$ 20 Ω
  - Load Voltage 350 V
  - Load Current 120 mA
  - Current Limit Protection
  - High Surge Capability
  - Clean Bounce Free Switching
  - Low Power Consumption
  - High Reliability Monolithic Receptor
- Two Independent Relays in a Single Package
- Package - **FLAT PAK**
- Isolation Test Voltage 3000 $V_{RMS}$
- Lead-free component
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC

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## Agency Approvals

- UL1577, File No. E52744 System Code L

## Applications

General Telecom Switching
- On/off Hook Control
- Ring Relay
- Ground Start

Industrial Controls
- Triac Predriver
- Output Modules

Peripherals
- Transducer Driver

Instrumentation
- Automatic Tuning/Balancing
- Flying Capacitor
- Analog Multiplexing

See "Solid State Relay" (Application Note 56)

## Description

The LH1532FP is a Dual 1 Form A (SPST) which can replace electromechanical relays in many applications. They are constructed using a GaAIAs LED for activation control and an integrated monolithic die for the switch output. The die is comprised of a photodiode array, switch control circuity and MOSFET switches. The SSR features low ON-resistance, high breakdown voltage and current-limit circuitry that protects the relay from telephone line induced lightning surges.

## Order Information

| Part | Remarks |
|---|---|
| LH1532FP | Tubes, SMD-8 |
| LH1532FPTR | Tape and Reel, SMD-8 |

## Absolute Maximum Ratings, $T_{amb}$ = 25 °C

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 time can adversely affect reliability.

### SSR

| Parameter | Test condition | Symbol | Value | Unit |
|---|---|---|---|---|
| LED continuous forward current | | $I_F$ | 50 | mA |
| LED reverse voltage | $I_R \leq 10\ \mu A$ | $V_R$ | 6.0 | V |
| DC or peak AC load voltage | $I_L \leq 50\ \mu A$ | $V_L$ | 350 | V |
| Continuous DC load current | | $I_L$ | 120 | mA |
| Ambient temperature range | | $T_{amb}$ | - 40 to + 85 | °C |
| Storage temperature range | | $T_{stg}$ | - 40 to + 125 | °C |
| Soldering temperature | t = 10 s max. | $T_{sld}$ | 260 | °C |
| Isolation test voltage | t = 1.0 s | $V_{ISO}$ | 3000 | $V_{RMS}$ |
| Isolation resistance | $V_{IO}$ = 500 V, $T_{amb}$ = 25 °C | $R_{IO}$ | $\geq 10^{12}$ | Ω |
| | $V_{IO}$ = 500 V, $T_{amb}$ = 100 °C | $R_{IO}$ | $\geq 10^{11}$ | Ω |
| Total power dissipation | | $P_{tot}$ | 600 | mW |

## Electrical Characteristics, $T_{amb}$ = 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.

### SSR

| Parameter | Test condition | Symbol | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|
| LED forward current for switch turn-on | $I_L$ = 100 mA, t = 10 ms | $I_{Fon}$ | | 1.2 | 3.0 | mA |
| LED forward current for switch turn-off | $V_L = \pm$ 300 V | $I_{Foff}$ | 0.2 | | | mA |
| LED forward voltage | $I_F$ = 10 mA | $V_F$ | 1.0 | 1.22 | 1.5 | V |
| ON-Resistance | $I_F$ = 5.0 mA, $I_L = \pm$ 50 mA | $R_{ON}$ | | 20 | 25 | Ω |
| OFF-Resistance | $I_F$ = 0 mA, $V_L = \pm$ 100 V | $R_{OFF}$ | | 5000 | | GΩ |
| Current limit | $I_F$ = 5.0 mA, t = 5.0 ms | $I_{Limit}$ | 170 | 210 | 250 | mA |
| Output off-state leakage current | $I_F$ = 0 mA, $V_L = \pm$ 100 V | $I_O$ | | 0.6 | 200 | nA |
| | $I_F$ = 0 mA, $V_L = \pm$ 350 V | $I_O$ | | | 1.0 | µA |
| Output capacitance | $I_F$ = 0 mA, $V_L = \pm$ 1.0 V | $C_O$ | | 55 | | pF |
| Pole-to-pole capacitance (S1 to S2) | $I_F$ = 5.0 mA | | | 0.5 | | pF |
| Turn-on time | $I_F$ = 5.0 mA, $I_L$ = 50 mA | $t_{on}$ | | 1.1 | 2.5 | ms |
| Turn-off time | $I_F$ = 5.0 mA, $I_L$ = 50 mA | $t_{off}$ | | 0.06 | 2.5 | ms |
| Switch offset | $I_F$ = 5.0 mA | $V_{OS}$ | | 0.15 | | µV |


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## Typical Characteristics (Tamb = 25 °C unless otherwise specified)

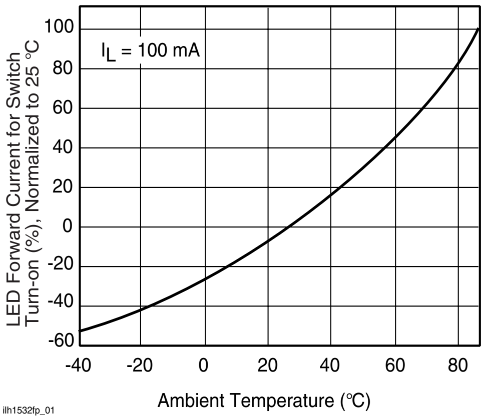



Figure 1. LED Current for Switch Turn-on vs. Temperature

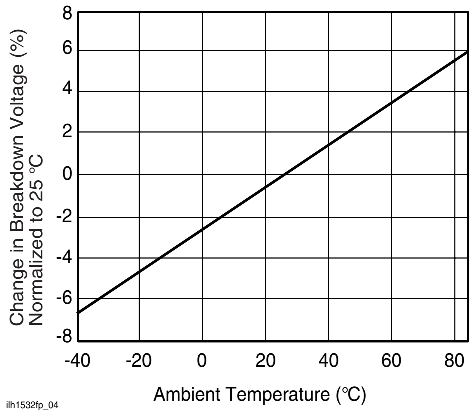



Figure 4. Switch Breakdown Voltage vs. Temperature

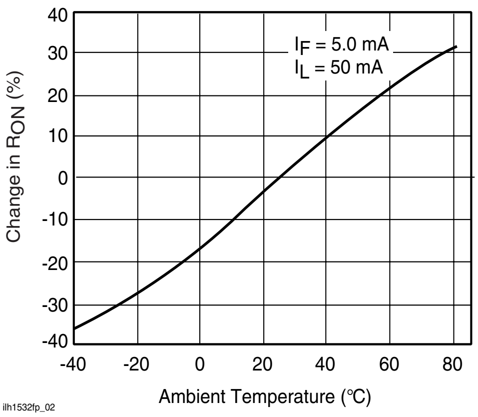



Figure 2. ON-Resistance vs. Temperature

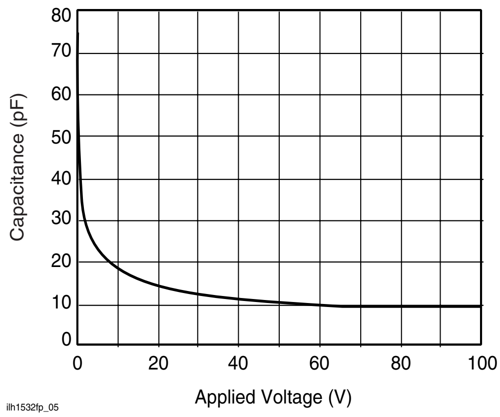



Figure 5. Switch Capacitance vs. Applied Voltage

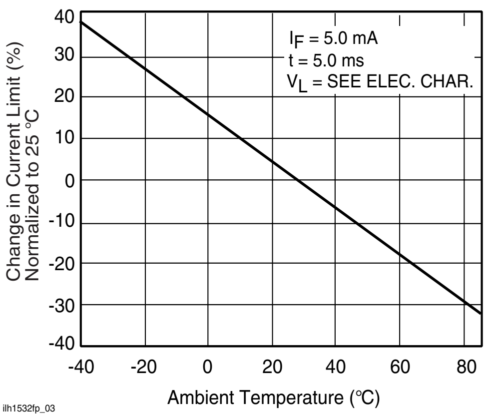



Figure 3. Current Limit vs. Temperature

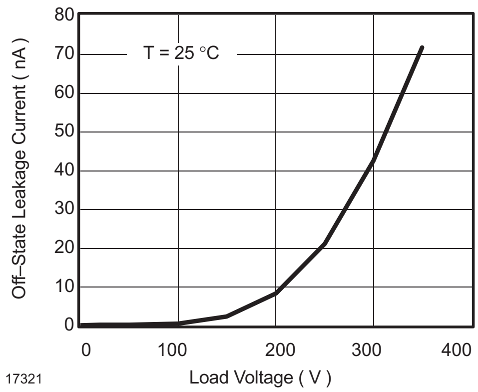



Figure 6. Leakage Current vs. Applied Voltage

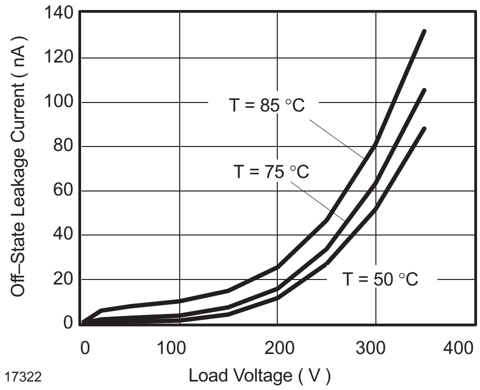



Figure 7. Leakage Current vs. Applied Voltage at Elevated Temperatures

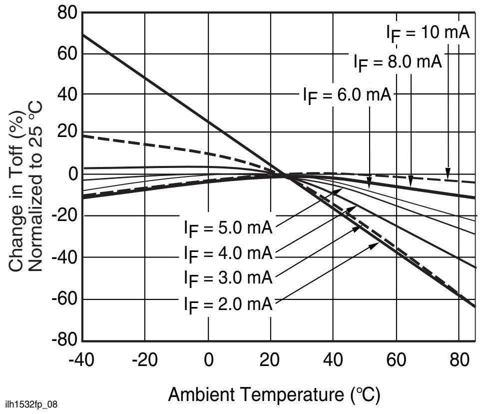



Figure 8. Turn-off Time vs. Temperature

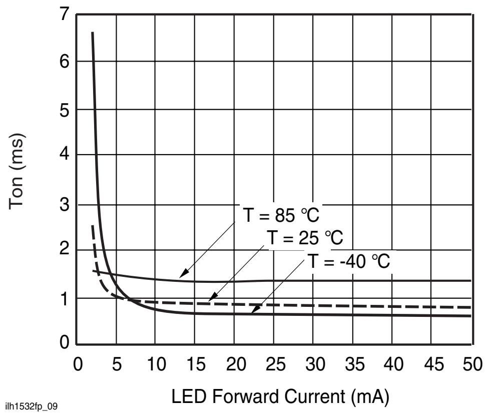
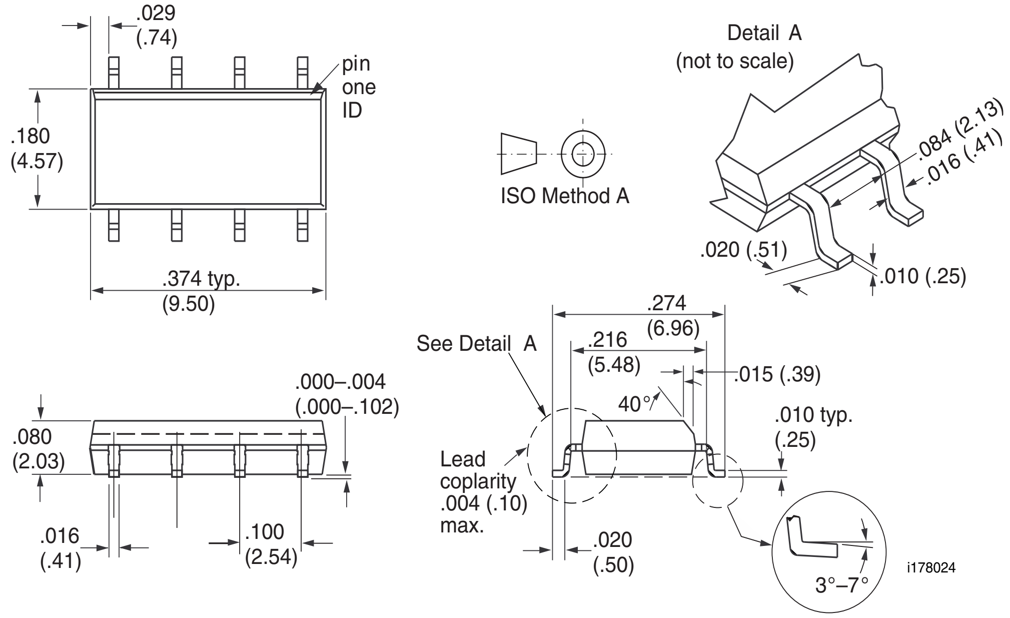



Figure 9. Turn-on Time vs. LED Current

## Package Dimensions in Inches (mm)



## Ozone Depleting Substances Policy Statement

It is the policy of Vishay Semiconductor GmbH to

1. Meet all present and future national and international statutory requirements.
2. Regularly and continuously improve the performance of our products, processes, distribution and operatingsystems with respect to their impact on the health and safety of our employees and the public, as well as their impact on the environment.

It is particular concern to control or eliminate releases of those substances into the atmosphere which are known as ozone depleting substances (ODSs).

The Montreal Protocol (1987) and its London Amendments (1990) intend to severely restrict the use of ODSs and forbid their use within the next ten years. Various national and international initiatives are pressing for an earlier ban on these substances.

Vishay Semiconductor GmbH has been able to use its policy of continuous improvements to eliminate the use of ODSs listed in the following documents.

1. Annex A, B and list of transitional substances of the Montreal Protocol and the London Amendments respectively
2. Class I and II ozone depleting substances in the Clean Air Act Amendments of 1990 by the Environmental Protection Agency (EPA) in the USA
3. Council Decision 88/540/EEC and 91/690/EEC Annex A, B and C (transitional substances) respectively.

Vishay Semiconductor GmbH can certify that our semiconductors are not manufactured with ozone depleting substances and do not contain such substances.

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