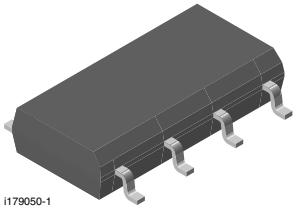
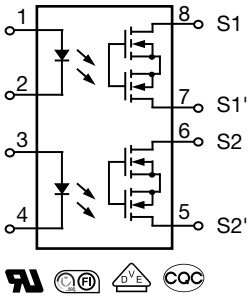
# Dual 1 Form A Solid-State Relay




## 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 $V_{RMS}$
- Material categorization: For definitions of compliance please see www.vishay.com/doc?99912

Pb-free

e3

RoHS COMPLIANT

## DESCRIPTION

The LH1532FP is a dual 1 form A (SPST) which can replace electromechanical relays in many applications. They are constructed using a GaAlAs 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.

## AGENCY APPROVALS

- UL1577, file no. E52744 system code O
- DIN EN 60747-5-5 (VDE 0884)
- FIMKO approval
- CQC GB4943.1-2011 (suitable for installation altitude below 2000 m)

## APPLICATIONS

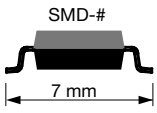
- General telecom switching
  - On/off hook control
  - Ring relay
  - Ground start
- Industrial controls
  - Triac predriver
  - Output modules
- Peripherals
  - Transducer driver
- Instrumentation
  - Automatic tuning/balancing
  - Flying capacitor
  - Analog multiplexing

**Note**

- See “solid-state relays” (application note 56)

## ORDERING INFORMATION

| L | H | 1 | 5 | 3 | 2 | F | P | T | R |
|---|---|---|---|---|---|---|---|---|---|
| PART NUMBER | | | | | | PACKAGE CONFIG. | | TAPE AND REEL | |




| PACKAGE | UL, FIMKO |
|---|---|
| SOP-8, tubes | LH1532FP |
| SOP-8, tape and reel | LH1532FPTR |

| **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 | $V_R$ | 6 | V |
| **OUTPUT** | | | | |
| DC or peak AC load voltage | $I_L \leq 50$ µA | $V_L$ | 350 | V |
| Continuous DC load current | | $I_L$ | 120 | mA |
| **SSR** | | | | |
| Ambient temperature range | | $T_{amb}$ | - 40 to + 85 | °C |
| Storage temperature range | | $T_{stg}$ | - 40 to + 125 | °C |
| Soldering temperature (1) | t = 10 s max. | $T_{sld}$ | 260 | °C |
| Isolation test voltage | t = 1 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 |

**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 reflow profile for soldering conditions for surface mounted devices.

| **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 | $I_{Fon}$ | | 1.2 | 3 | mA |
| LED forward current, switch turn-off | $V_L$ = ± 300 V | $I_{Foff}$ | 0.2 | | | mA |
| LED forward voltage | $I_F$ = 10 mA | $V_F$ | 1 | 1.22 | 1.5 | V |
| **OUTPUT** | | | | | | |
| On-resistance | $I_F$ = 5 mA, $I_L$ = ± 50 mA | $R_{ON}$ | | 20 | 25 | Ω |
| Off-resistance | $I_F$ = 0 mA, $V_L$ = ± 100 V | $R_{OFF}$ | | 5000 | | GΩ |
| Current limit | $I_F$ = 5 mA, t = 5 ms | $I_{Limit}$ | 170 | 210 | 250 | mA |
| Output off-state leakage current | $I_F$ = 0 mA, $V_L$ = ± 100 V | $I_O$ | | 0.6 | 200 | nA |
| | $I_F$ = 0 mA, $V_L$ = ± 350 V | $I_O$ | | | 1 | µA |
| Output capacitance | $I_F$ = 0 mA, $V_L$ = ± 1 V | $C_O$ | | 55 | | pF |
| Pole-to-pole capacitance (S1 to S2) | $I_F$ = 5 mA | | | 0.5 | | pF |
| **TRANSFER** | | | | | | |
| Switch offset | $I_F$ = 5 mA | $V_{OS}$ | | 0.15 | | µV |

**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 mA, $I_L$ = 50 mA | $t_{on}$ | | 1.1 | 2.5 | ms |
| Turn-off time | $I_F$ = 5 mA, $I_L$ = 50 mA | $t_{off}$ | | 0.06 | 2.5 | ms |

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

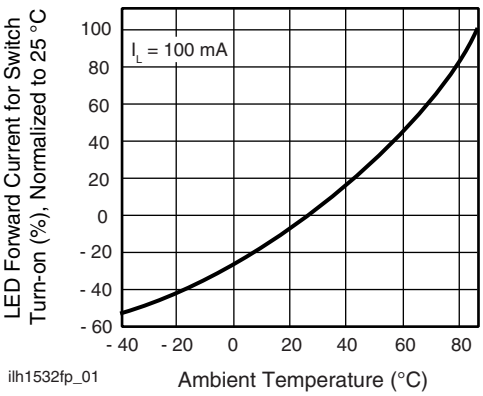



Fig. 1 - LED Current for Switch Turn-on vs. Temperature

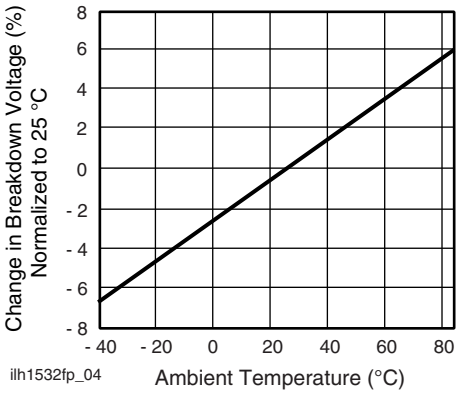



Fig. 4 - Switch Breakdown Voltage vs. Temperature

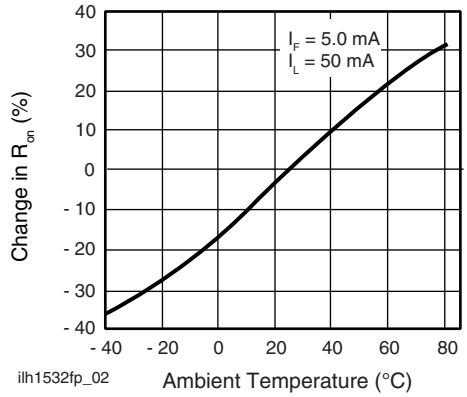



Fig. 2 - On-Resistance vs. Temperature

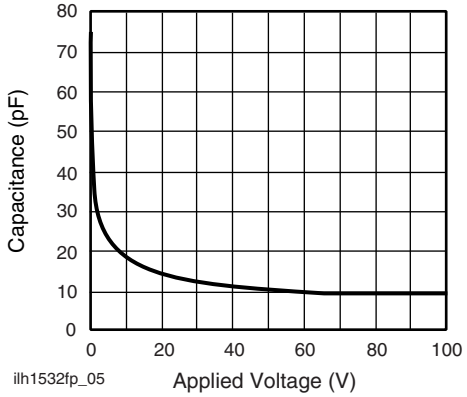



Fig. 5 - Switch Capacitance vs. Applied Voltage

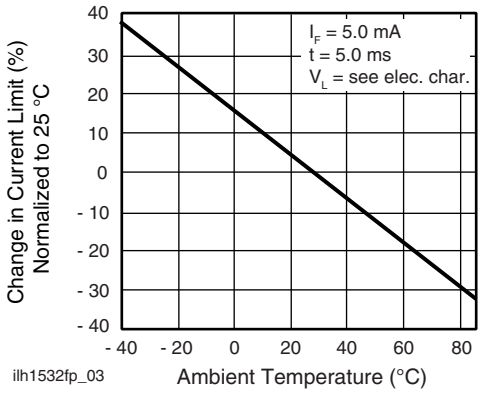



Fig. 3 - Current Limit vs. Temperature

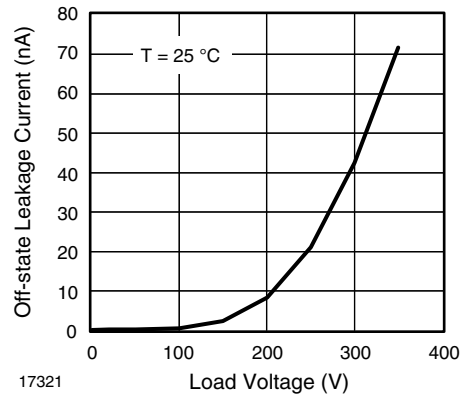



Fig. 6 - Leakage Current vs. Applied Voltage

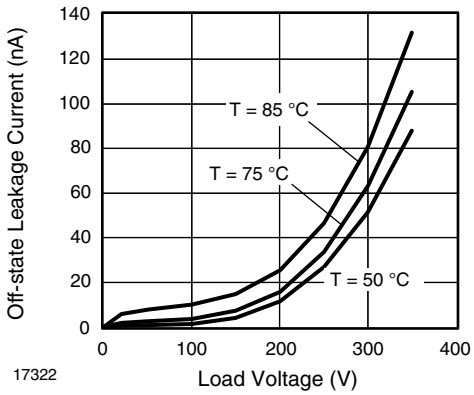



Fig. 7 - Leakage Current vs.
Applied Voltage at Elevated Temperatures

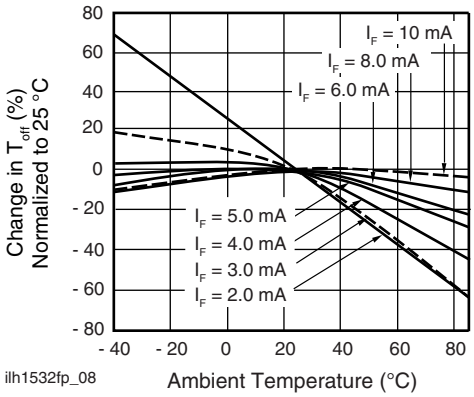



Fig. 8 - Turn-off Time vs. Temperature

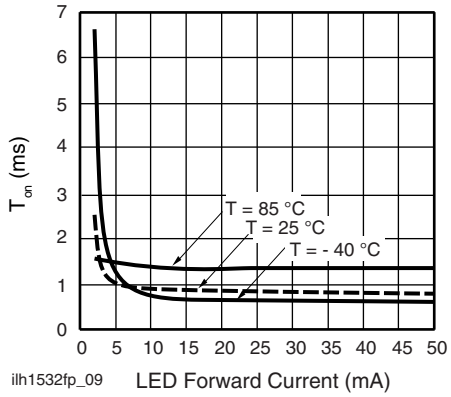
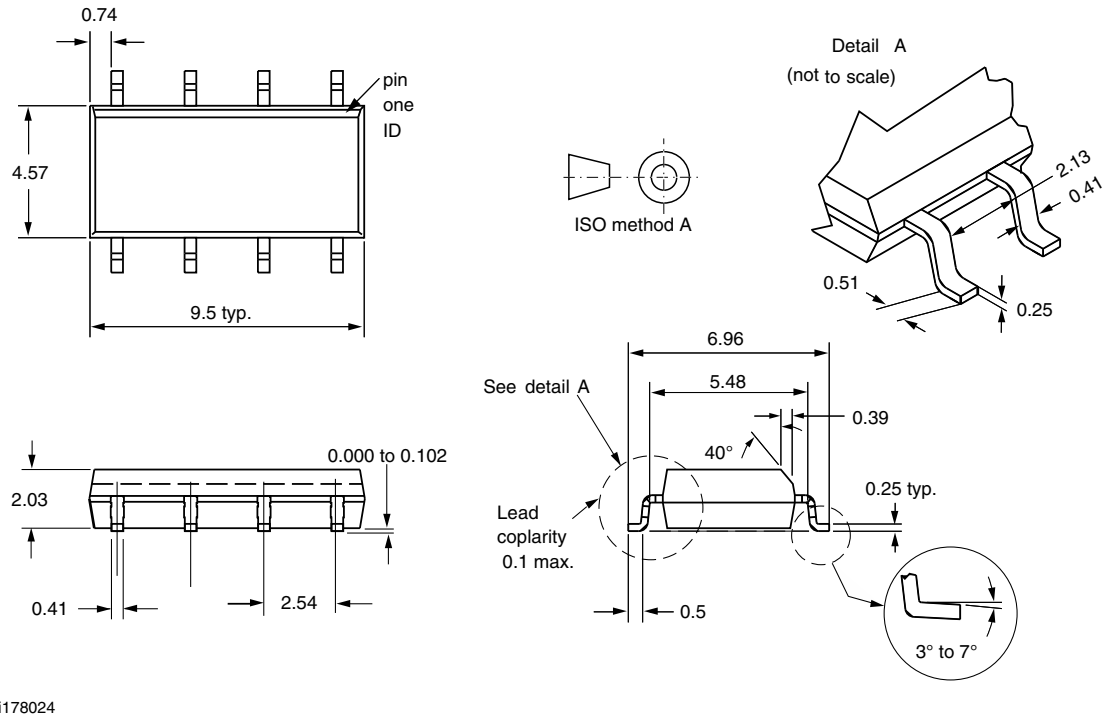
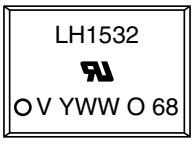



Fig. 9 - Turn-on Time vs. LED Current

## PACKAGE DIMENSIONS in millimeters




## PACKAGE MARKING (example)




**Note**

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

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