DATA SHEET

# OLH400: High-Speed Hermetic, Low-Input Current Optocoupler

## Features

- Electrical parameters guaranteed over –55 °C to +125 °C ambient temperature range
- 1000 $V_{DC}$ electrical isolation
- Low input current: 0.5 mA
- Low output $V_{SAT}$: 0.1 V typical
- High current transfer ratio (CTR)
- Low power consumption
- Similar to industry standard parts: 6N138/6N139 in plastic and 6N140 in hermetic DIP packages
- Offers 100% high reliability screenings

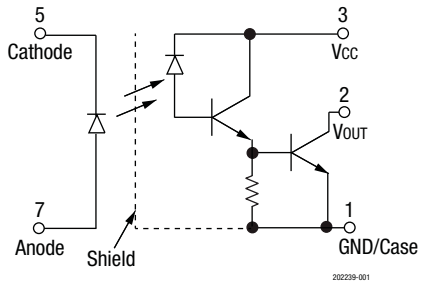


**Figure 1. OLH400 Block Diagram**

## Description

The OLH400 has a high CTR at low input currents, making it ideal for applications such as Metal Oxide Semiconductors (MOS), Complementary MOS (CMOS), and low-power logic interfacing or RS-232C data transmission systems. Each OLH400 has an LED and integrated photodiode Darlington detector I/C, mounted and coupled in a custom hermetic surface-mount Leadless Chip Carrier (LCC) package that provides 1000 $V_{DC}$ electrical isolation between the input and output.

The Darlington detector has an integrated base-to-emitter resistor for superior high-temperature performance. The split Darlington design permits lower output saturation voltage and higher switching speed operation than is possible with conventional photo-Darlington designs. The internal shield provides excellent common mode immunity performance.

Figure 1 shows the OLH400 functional block diagram. Table 1 provides the OLH400 absolute maximum ratings. Table 2 provides the OLH400 electrical specifications.

Figures 2 through 5 illustrate the OLH400 typical performance characteristics. Figure 6 shows the OLH400 switching test circuit. Figure 7 provides the OLH400 package dimensions.

**Table 1. OLH400 Absolute Maximum Ratings[1]**

| Parameter | Symbol | Minimum | Maximum | Units |
|---|---|---|---|---|
| ***Coupled*** | | | | |
| Input to output isolation voltage[1] | $V_{OC}$ | –1000 | +1500 | V |
| Storage temperature | $T_{STG}$ | –65 | +150 | °C |
| Operating temperature | $T_A$ | –55 | +125 | °C |
| Mounting temperature range (3 minutes maximum) | | | +240 | °C |
| ***Input Diode*** | | | | |
| Average input current | $I_{DD}$ | | 20 | mA |
| Peak forward current (≤ 1 ms duration} | $I_F$ | | 40 | mA |
| Reverse voltage | $V_R$ | | 5 | V |
| Power dissipation | Po | | 36 | mW |
| ***Output Detector*** | | | | |
| Average output current | | | +40 | mA |
| Supply voltage | $V_{CC}$ | –0.5 | +20.0 | V |
| Output voltage | $V_{OUT}$ | –0.5 | +20.0 | V |
| Power dissipation | Po | | +50 | mW |

[1] Exposure to maximum rating conditions for extended periods may reduce device reliability. There is no damage to the device with only one parameter set at the limit and all other parameters set at or below their nominal value. Exceeding any of the limits listed here may result in permanent damage to the device.

[2] Measured between pins 1, 2, and 3 shorted together, and pins 5, 6, and 7 shorted together. $T_A$ = 25°C and duration = 1 second.

***ESD HANDLING***: *Although this device is designed to be as robust as possible, electrostatic discharge (ESD) can damage this device. This device must be protected at all times from ESD when handling or transporting. Static charges may easily produce potentials of several kilovolts on the human body or equipment, which can discharge without detection. Industry-standard ESD handling precautions should be used at all times.*

**Table 2. OLH400 Electrical Specifications[1]**
**($T_A$ = –55 °C to +125 °C, Unless Otherwise Noted)**

| Parameter | Symbol | Test Condition | Minimum | Typical | Maximum | Units |
|---|---|---|---|---|---|---|
| Current transfer ratio[2] | CTR | $I_F$ = 0.5 mA, $V_O$ = 0.4 V, $V_{CC}$ = 4.5 V | 300 | | | % |
| | | $I_F$ = 1.6 mA, $V_O$ = 0.4 V, $V_{CC}$ = 4.5 V | 300 | | | % |
| | | $I_F$ = 5.0 mA, $V_O$ = 0.4 V, $V_{CC}$ = 4.5 V | 200 | | | % |
| Logic: | | | | | | |
| Low output voltage | $V_{OL}$ | $I_F$ = 0.5 mA, $I_{OL}$ = 1.5 mA, $V_{CC}$ = 4.5 V | | 0.1 | 0.4 | V |
| | | $I_F$ = 5.0 mA, $I_{OL}$ = 10.0 mA, $V_{CC}$ = 4.5 V | | 0.2 | 0.4 | V |
| High output current | $I_{OH}$ | $I_F$ = 0 mA, $V_O$ = $V_{CC}$ = 18 V | | 0.005 | 250.00 | µA |
| Low supply current | $I_{CCL}$ | $I_F$ = 1.6 mA, $V_{CC}$ = 18 V | | 0.6 | 2.0 | mA |
| High supply current | $I_{CCH}$ | $I_F$ = 0 mA, $V_{CC}$ = 18 V | | 0.01 | 40.0 | µA |
| Input: | | | | | | |
| Input forward voltage | $V_F$ | $I_F$ = 1.6 mA | | 1.65 | 2.0 | V |
| Reverse breakdown voltage | $B_{VR}$ | $I_R$ = 10 µA | 3 | | | V |
| Output leakage current[3] | $I_{I-O}$ | $R_H \leq$ 50%, $T_A$ = 25 °C, $V_{I-O}$ = 1000 $V_{DC}$ | | | 1 | µA |
| Propagation delay time: | | | | | | |
| Logic high to low | $t_{PHL}$ | $I_F$ = 0.5 mA, $R_L$ = 4.7 kΩ, $V_{CC}$ = 5.0 V, $T_A$ = 25 °C | | 26 | 100 | µs |
| | | $I_F$ = 5 mA, $R_L$ = 680 Ω, $V_{CC}$ = 5 V, $T_A$ = 25 °C | | 2 | 10 | µs |
| Logic low to high | $t_{PLH}$ | $I_F$ = 0.5 mA, $R_L$ = 4.7 kΩ, $V_{CC}$ = 5.0 V, $T_A$ = 25 °C | | 28 | 60 | µs |
| | | $I_F$ = 5 mA, $R_L$ = 680 Ω, $V_{CC}$ = 5 V, $T_A$ = 25 °C | | 10 | 30 | µs |
| Common mode transient immunity: | | | | | | |
| Logic high level | $CM_H$ | $I_F$ = 0 mA, $V_{CC}$ = 5 V, $T_A$ = 25 °C | 500 | ≥2000 | | V/µs |
| Logic low level | $CM_L$ | $I_F$ = 1.6 mA, $R_L$ = 1.5 kΩ, $V_{CM}$ = 50 V, $V_{CC}$ = 5 V, $T_A$ = 25 °C | 500 | ≥2000 | | V/µs |

[1] Exposure to maximum rating conditions for extended periods may reduce device reliability. There is no damage to the device with only one parameter set at the limit and all other parameters set at or below their nominal value. Exceeding any of the limits listed here may result in permanent damage to the device.

[2] CTR is defined as the ratio of the output collector current $I_C$ to the forward LED current $I_F$, multiplied by 100%.

[3] Measured between pins 1, 2, and 3 shorted together, and pins 5, 6, and 7 shorted together. $T_A$ = 25°C and duration = 1 second.

## Typical Performance Characteristics

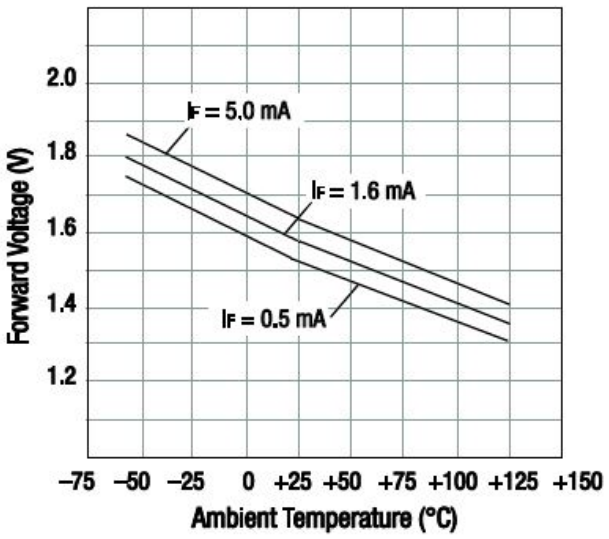


**Figure 2. LED Forward Voltage vs Temperature**

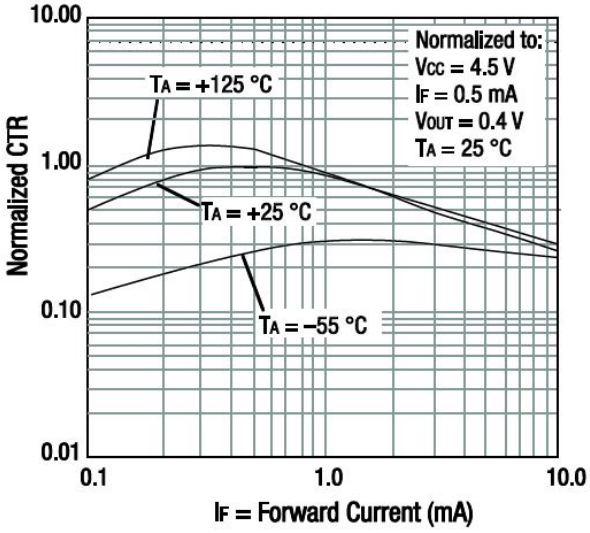


**Figure 3. Normalized CTR vs Input Diode Forward Current**

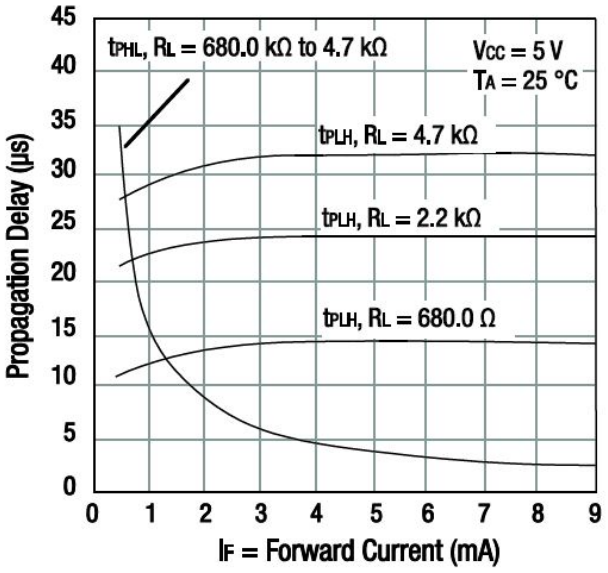


**Figure 4. Propagation Delay vs Input Diode Forward Current**

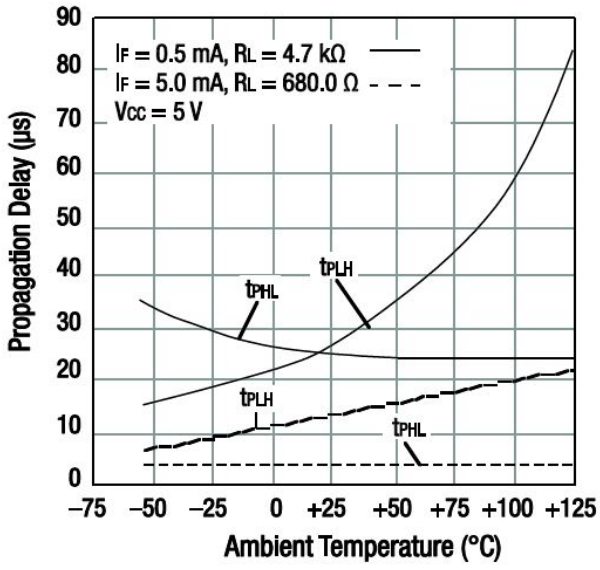


**Figure 5. Propagation Delay vs Temperature**

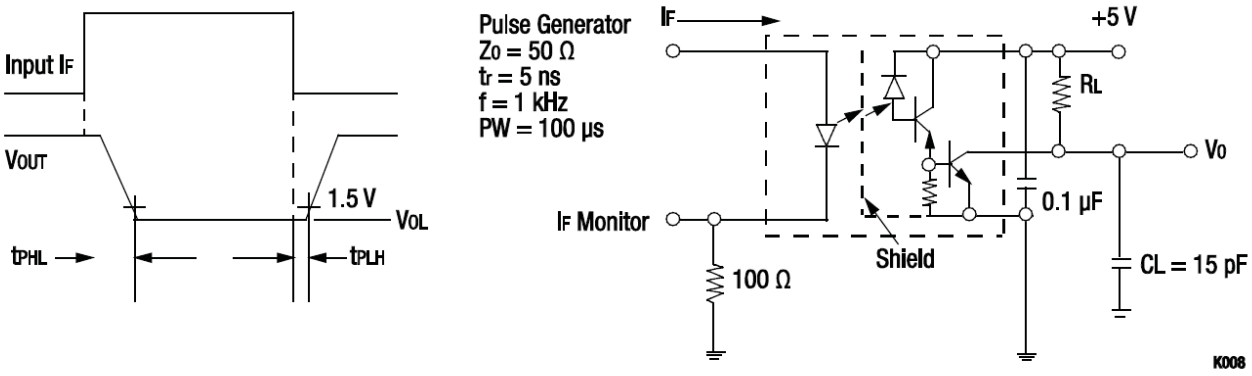


**Figure 6. OLH400 Switching Test Circuit**

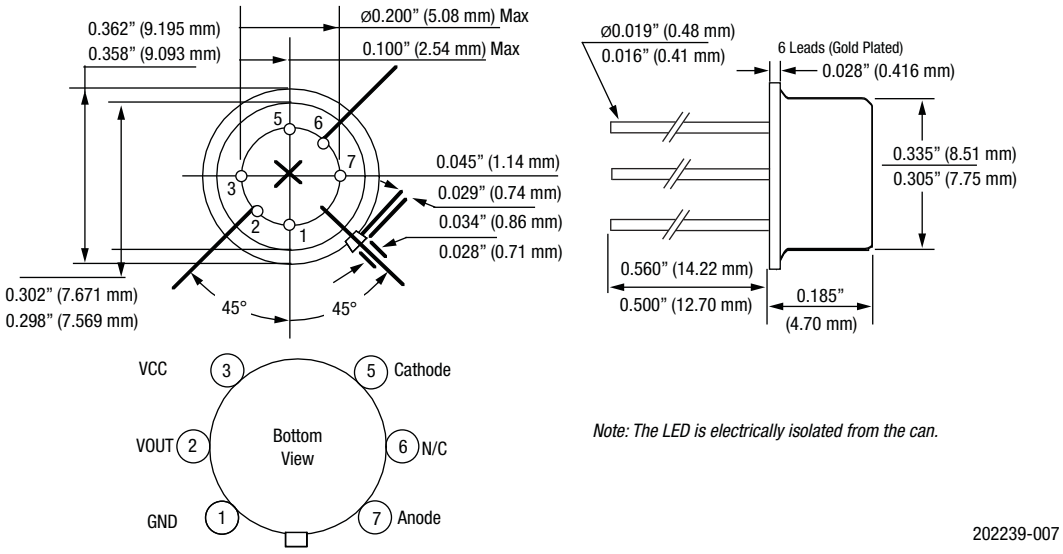


**Figure 7. OLH400 Package Dimensions**

## Ordering Information

| Model Name | Manufacturing Part Number |
|---|---|
| OLH400: High-Speed Hermetic, Low-Input Current Optocoupler | OLH400 |