

OLH7000: Hermetic Linear Optocoupler

Applications

- Aerospace
- Defense
- Industrial
- Commercial

Features

- High reliability and rugged hermetic construction
- Couples ac and dc signals
- 1000 V_{DC} electrical isolation
- Matched photodiodes
- Excellent linearity and stability
- High-reliability screening available
 - MIL-STD-883 Class B equivalent
 - MIL-PRF-19500 JAN, JANTX, JANTXV, JANS equivalent
 - MIL-PRF-38534 Class H, K equivalent
 - Per customer requirements
- For RoHS and other product compliance information, see the [Skyworks Certificate of Conformance](#).

Description

The OLH7000 linear optocoupler consists of two LEDs in series coupled to two PIN photodiode detectors.

The photodiode on the input acts as a feedback device that permits an external feedback loop to ensure constant LED output. A similar matching photodiode on the output drives an output circuit electrically isolated from the input.

A fixed relationship is maintained between the input and output, and compensates for the nonlinear, time, and temperature characteristics of the LED.

Each OLH7000 is housed in an 8-pin hermetically sealed ceramic dual in-line package (DIP) with 1000 V_{DC} electrical isolation between the input and output.

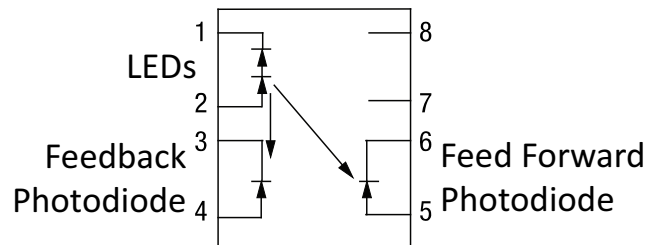


Figure 1. Functional Block Diagram and Pinout

Table 1. Pin Descriptions

Pin	Description
1	Cathode
2	Anode
3	V _{CC}
4	Anode
5	Anode
6	V _{CC}
7	N/C
8	N/C

OLH7000 devices are offered as unscreened as well as screened versions to customer requirements, including MIL-STD-883 Class B equivalent, MIL-PRF-19500 JAN, JANTX, JANTXV, JANS equivalent and MIL-PRF-38534 Class H, K equivalent.

Electrical Specifications

Table 2. Absolute Maximum Ratings¹
($T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted)

Parameter	Symbol	Conditions	Min	Max	Units
Input LED					
Average forward current	I_{DD}			60	mA
Peak forward current	I_{FPK}	Duration $\leq 1\text{ ms}$		100	mA
Reverse voltage	V_R			6	V
Input power dissipation	P_D			100	mW
Output Photodiodes					
Forward voltage	V_F			0.3	V
Reverse voltage	V_R			30	V
Coupler					
Input to output isolation voltage ²	V_{ISO}	$T_A = 25\text{ }^\circ\text{C}$, duration = 1 s	-1000	1000	V
Storage temperature range	T_{STG}		-65	150	$^\circ\text{C}$
Operating temperature range	T_A		-55	125	$^\circ\text{C}$
Soldering temperature	T_{SLD}	20 seconds		240	$^\circ\text{C}$
Total power dissipation	P_D			250	mW
Electrostatic Discharge					
MIL-STD-883, Method 3015 Human Body Model (HBM)	ESD	Class 1B rating		999	V

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, 3 and 4 shorted together, and pins 5, 6, 7, and 8 shorted together.

ESD Handling: Industry-standard ESD handling precautions must be adhered to at all times to avoid damage to this device.

Table 3. Electrical Specifications¹
($T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Input LED						
Forward voltage	V_F	$I_F = 10\text{ mA}$		2.5	3.3	V
Reverse voltage	V_R	$I_R = 100\text{ }\mu\text{A}$	5			V
Output Photodiodes						
Dark current	I_D	$V_R = 15\text{ V}, I_F = 0\text{ mA}$		1	25	nA
Open circuit voltage	V_{OC}	$I_F = 10\text{ mA}$		500		mV
Junction capacitance	C_J	$V_F = 0\text{ V}, f = 1\text{ MHz}$		12		pF
Coupler						
K1, servo current gain (I_{P1} / I_F)	K1	$I_F = 10\text{ mA}, V_{DET} = -15\text{ V}^2$	0.0025	0.0100	0.0175	
Servo current	I_{P1}			100		μA
K2, forward current gain (I_{P2} / I_F)	K2		0.0025	0.0100	0.0175	
Forward current	I_{P2}			100		μA
K3, transfer gain (K2/K1)	K3		0.75	1.00	1.25	
Frequency response ³	$BW_{(-3\text{ dB})}$	$I_F = 10\text{ mA} \pm 4.0\text{ mA}, R_L = 50\text{ }\Omega$		200		kHz
Phase response at 200 kHz				-45		Degrees
Input-output capacitance	C_{I-O}	$V_{I-O} = 0\text{ V}, f = 1\text{ MHz}$		1.5		pF
Input-output resistance ⁴	R_{I-O}	$V_{I-O} = 500\text{ V}_{DC}$		10		$\text{G}\Omega$
Input-output leakage current ⁴	WTV	$R_H \leq 50\%, V_{I-O} = 1000\text{ V}_{DC}$			1	μA
Switching Characteristics						
Rise time	t_r	$I_F = 10\text{ mA} \pm 4\text{ mA}, R_L = 5\text{ k}\Omega$		2		μs
Fall time	t_f	$I_F = 10\text{ mA} \pm 4\text{ mA}, R_L = 5\text{ k}\Omega$		2		μs

1. Performance is assured only under the conditions listed in the above table.
2. $V_{DET} = V_A - V_{CC}$, where $V_{CC} = 15\text{ V}$
3. Assured but not tested, characterized only at initial release.
4. Measured between pins 1, 2, 3, and 4 shorted together, and pins 5, 6, 7, and 8 shorted together. $T_A = 25^\circ$, duration = 1 sec

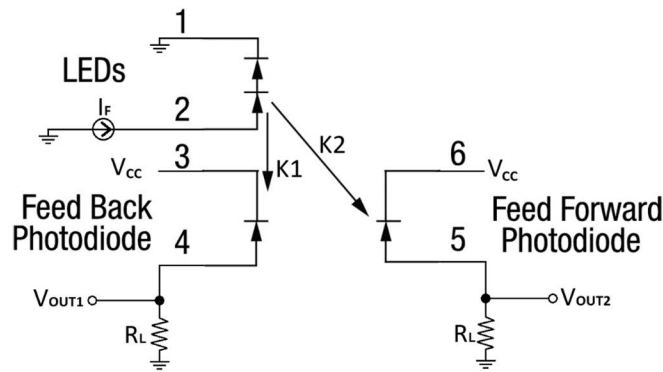
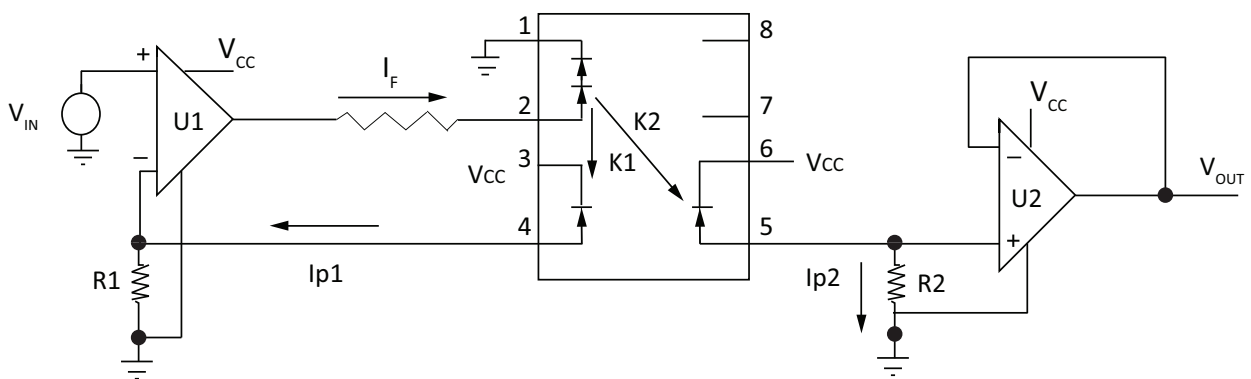


Figure 2. Switching Test Circuit



This typical application circuit uses an operational amplifier at the input side to drive the LEDs. The output photodiode is connected to a non-inverting voltage follower amplifier. The overall transfer gain, V_{OUT}/V_{IN} , equals $(K2 \cdot R2)/(K1 \cdot R1)$. Because $(K2/K1) = K3$, the circuit gain becomes $K3 (R2/R1)$.

Figure 3. Typical Application Circuit

Typical Performance Characteristics ($T_A = 25^\circ\text{C}$, Unless Otherwise Indicated)

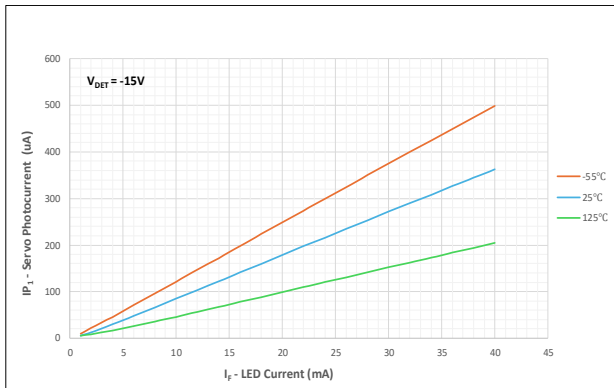


Figure 4. Servo Photocurrent vs. LED current

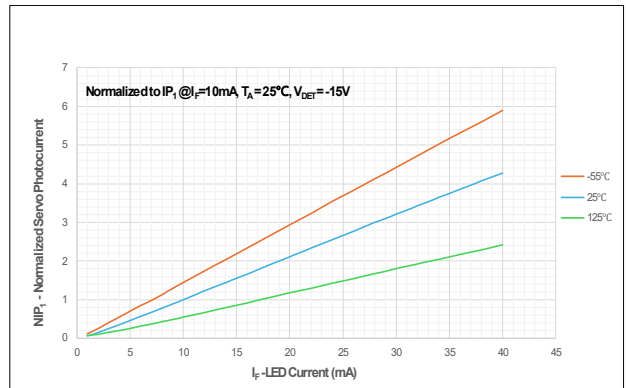


Figure 5. Normalized Servo Photocurrent vs. LED current

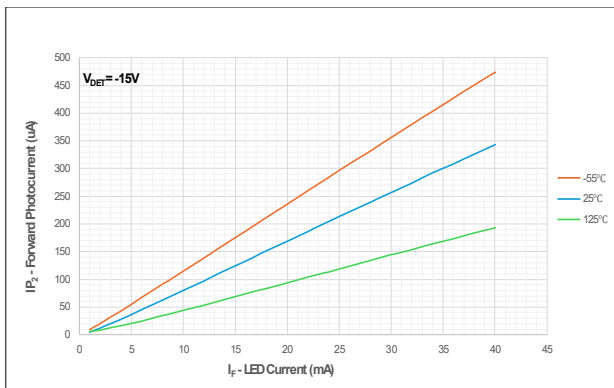


Figure 6. Forward Photocurrent vs. LED current

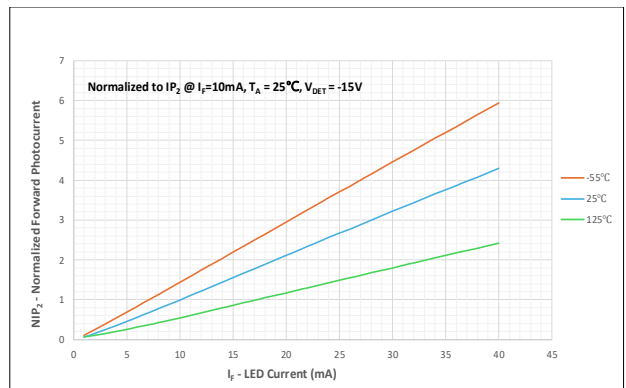


Figure 7. Normalized Forward Photocurrent vs. LED current

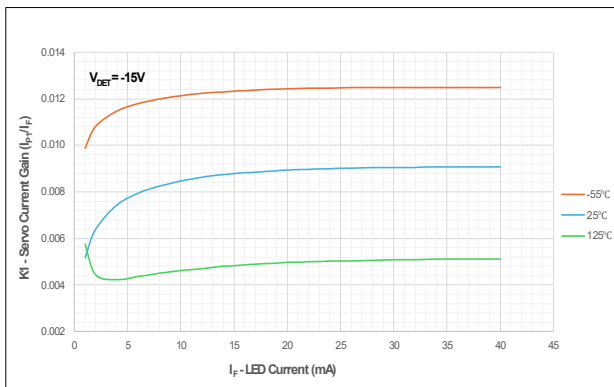


Figure 8. Servo Current Gain vs. LED Current

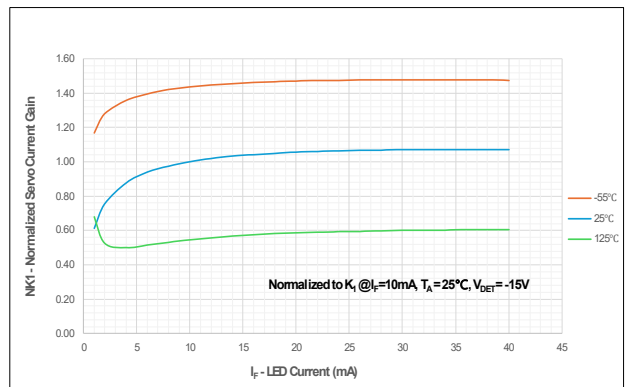


Figure 9. Normalized Servo Current Gain vs. LED Current

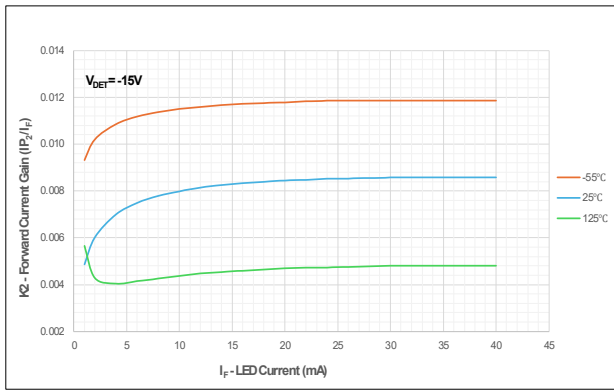


Figure 10. Forward Current Gain vs. LED Current

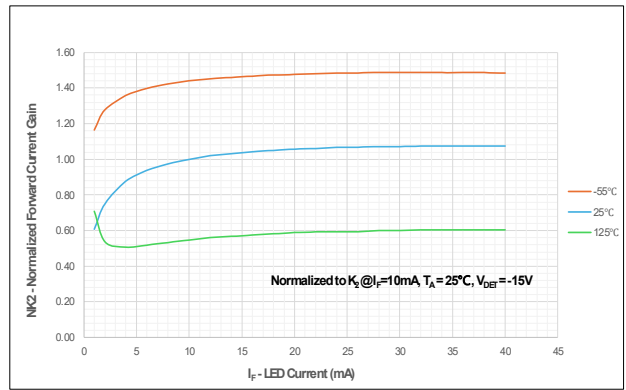


Figure 11. Normalized Forward Current Gain vs. LED Current

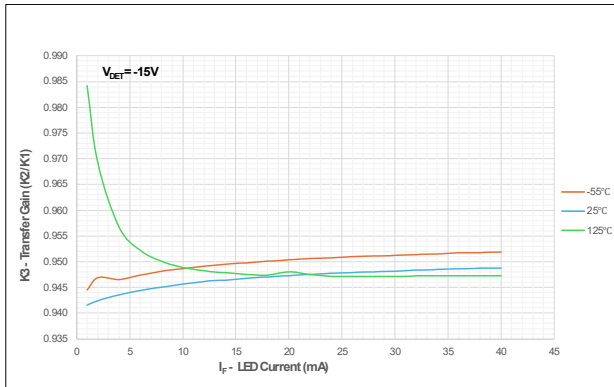


Figure 12. Transfer Gain vs. LED Current

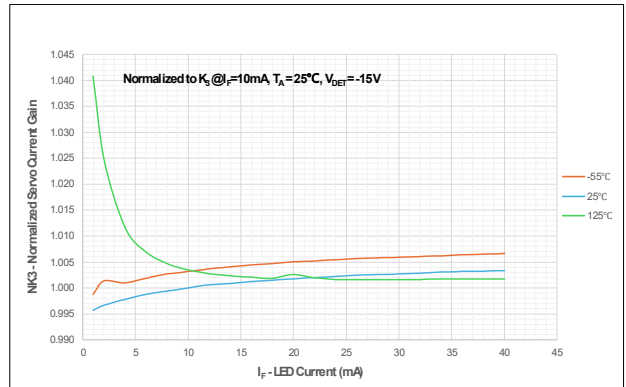


Figure 13. Normalized Transfer Gain vs. LED Current

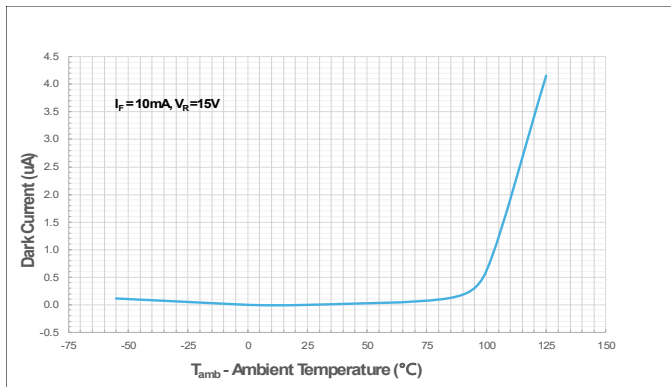


Figure 14. Dark Current vs. Temperature

Package and Handling Information

Instructions on the shipping container label regarding exposure to moisture after the container seal is broken must be followed. Otherwise, problems related to moisture absorption may occur when the part is subjected to high temperature during solder assembly.

Care must be taken when attaching this product, whether it is done manually or in a production solder reflow environment.

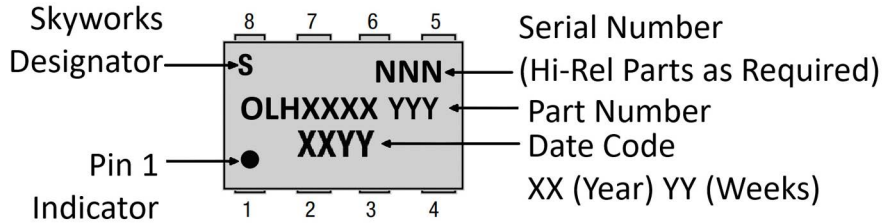


Figure 15. Typical Part Marking

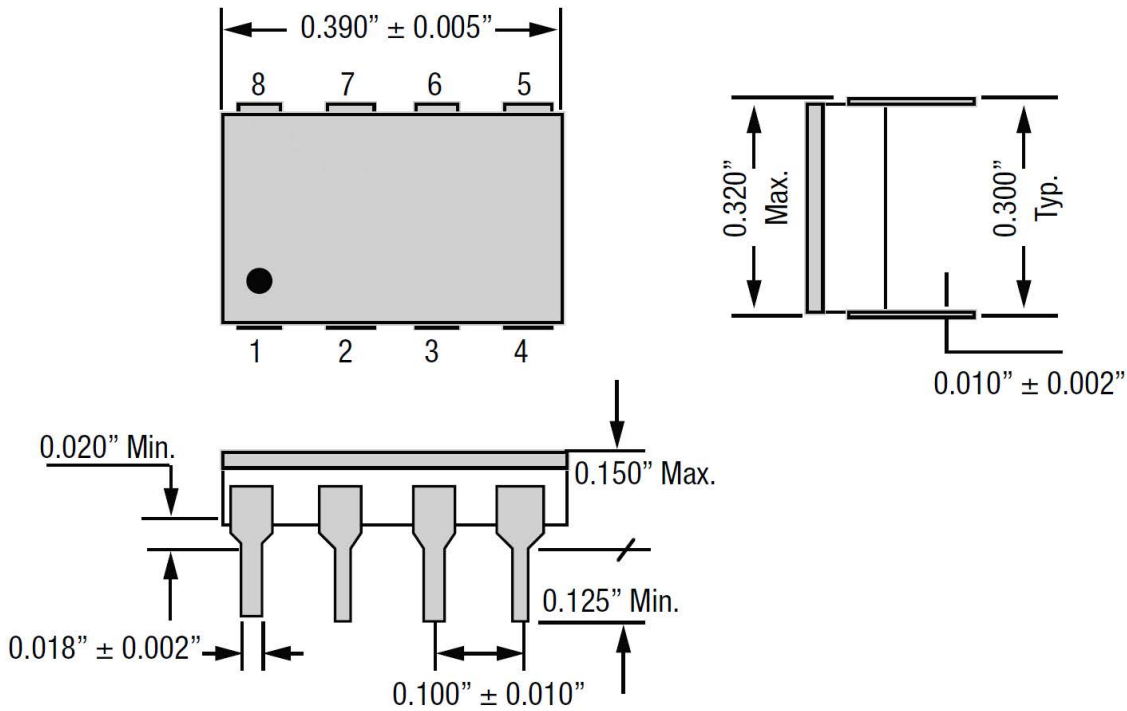


Figure 16. Package Dimensions

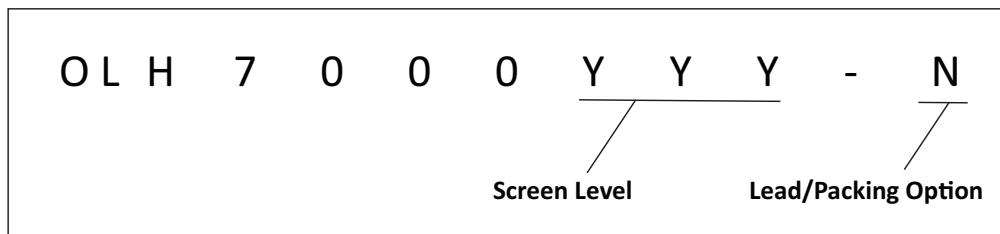
Table 4. Additional Package Information

	8-Lead DIP
	Through hole
Lead finish/plating	Min 100 μ in Au over min 80 μ in Ni
Lead thickness	10 mils
Hermetic	Yes
Max package weight	0.850 grams
CAGE code 0JGG3	

Table 5. Related Parts

Part Number	Package	Description	Comments
OLS700	6-lead LCC	Hermetic Surface Mount Isolinear Optocoupler	High linearity, 1000 VDC electrical isolation

Ordering Information



Screen Level	Hermetic 8-lead DIP (Single-Channel)
Catalog	OLH7000
MIL-STD-883 Class B equivalent	OLH7000SB
JANTX equivalent	OLH7000SX
JANTXV equivalent	OLH7000SXV
JANS equivalent	OLH7000PS
Lead Finish and Packing Options (-N)	
Non-solder dipped and standard packing	Blank
Solder dipped	-1
Tape and reel	N/A
Solder dip and tape and reel	N/A
Standard packing	Tubes

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