PRELIMINARY DATA SHEET

OLH7100: Hermetic Linear Optocoupler

Applications

- Aerospace
- Defense
- Extreme industrial
- High reliability

Features

- High reliability and rugged hermetic construction
- Couples ac and dc signals
- 1000 V_{DC} electrical isolation
- Matched photodiodes
- Excellent linearity and temperature 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 OLH7100 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 OLH7100 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.

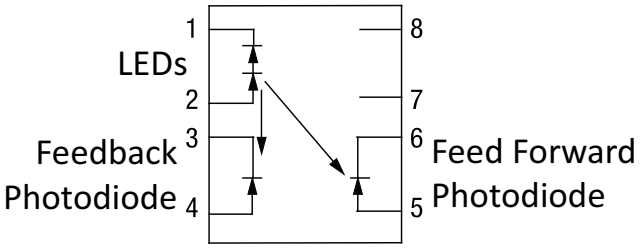


Figure 1. Functional Block Diagram and Pinout

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

OLH7100 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 Ratings[1]

(T_A = 25 °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 ≤ 1 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 °C, duration = 1 s	–1000	1000	V
Storage temperature range	T_{STG}		–65	150	°C
Operating temperature range	T_A		–55	125	°C
Soldering temperature	T_{SLD}	20 seconds		240	°C
Total power dissipation	P_D			250	mW
Electrostatic Discharge					
MIL-STD-883, Method 3015 Human Body Model (HBM)	ESD	Class 1B rating		TBD	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 Specifications[1]

(T_A = 25 °C, unless otherwise noted)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Input LED						
Forward voltage	V_F	I_F = 10 mA		2.75	3.3	V
Reverse voltage	V_R	I_R = 100 µA	5			V
Output Photodiodes						
Dark current	I_D	V_R = 15 V, I_F = 0 mA		1	25	nA
Open circuit voltage	V_{OC}	I_F = 10 mA		500		mV
Junction capacitance	C_J	V_F = 0 V, f = 1 MHz		12		pF
Coupler						
K1, servo current gain (I_{P1}/I_F)	K1	T_A = 25 °C, I_F = 10 mA, V_{DET}[2] = –15 V	0.01	0.0175	0.025	
Servo current	I_{P1}		100	175	250	µA
K1, servo current gain (I_{P1}/I_F)	K1	T_A = 125 °C, I_F = 10 mA, V_{DET}[2] = –15 V	0.005		0.02	
Servo current	I_{P1}		50		200	µA
K1, servo current gain (I_{P1}/I_F)	K1	T_A = –55 °C, I_F = 10 mA, V_{DET}[2] = –15 V	0.015		0.0275	
Servo current	I_{P1}		150		275	µA
K2, forward current gain (I_{P2}/I_F)	K2	T_A = 25 °C, I_F = 10 mA, V_{DET}[2] = –15 V	0.01	0.0175	0.025	
Forward current	I_{P2}		100	175	250	µA
K2, forward current gain (I_{P2}/I_F)	K2	T_A = 125 °C, I_F = 10 mA, V_{DET}[2] = –15 V	0.005		0.02	
Forward current	I_{P2}		50		200	µA
K2, forward current gain (I_{P2}/I_F)	K2	T_A = –55 °C, I_F = 10 mA, V_{DET}[2] = –15 V	0.015		0.0275	
Forward current	I_{P2}		150		275	µA
K3, transfer gain (K2/K1)	K3	T_A = –55 to 125 °C, I_F = 10 mA, V_{DET}[2] = –15 V	0.75	1.00	1.25	
Transfer gain linearity	ΔK3	T_A = 25 °C, I_F = 1 mA to 40 mA		0.5		%
Transfer gain temperature coefficient	ΔK3/ΔTA	T_A = –55 to 125 °C, I_F = 10 mA, V_{DET}[2] = –15 V		50		ppm/°C

Table 3. Electrical Specifications[1] (Continued)

(T_A = 25 °C, unless otherwise noted)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Frequency response[3]	$BW_{(-3\ dB)}$	I_F = 10 mA ± 4.0 mA, R_L = 50 Ω		200		kHz
Phase response at 200 kHz[3]	Φ			–45		Degrees
Input-output capacitance[4]	C_{I-O}	V_{I-O} = 0 V, f = 1 MHz		1.5		pF
Input-output resistance[4]	R_{I-O}	V_{I-O} = 500 V_{DC}		10		GΩ
Input-output leakage current[4]	WTV	R_H ≤ 50%, V_{I-O} = 1000 V_{DC}			1	µA
Switching Characteristics						
Rise time	t_r	I_F = 10 mA ± 4 mA, R_L = 5 kΩ		2		µs
Fall time	t_f	I_F = 10 mA ± 4mA, R_L = 5 kΩ		2		µs

1. Performance is assured only under the conditions listed in the above table. Catalog OLH7100 is 100% tested at T_A = 25 °C and specifications over temperature are assured by design or initial characterization.
2. $V_{DET} = V_A - V_{CC}$, where V_{CC} = 15 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 °C, duration =1 sec.

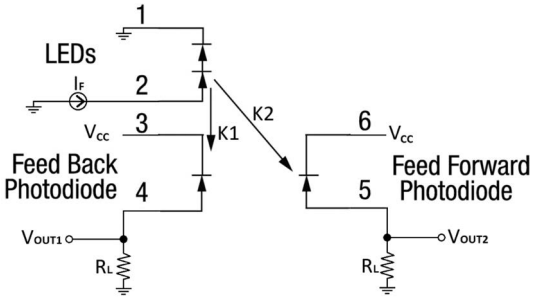
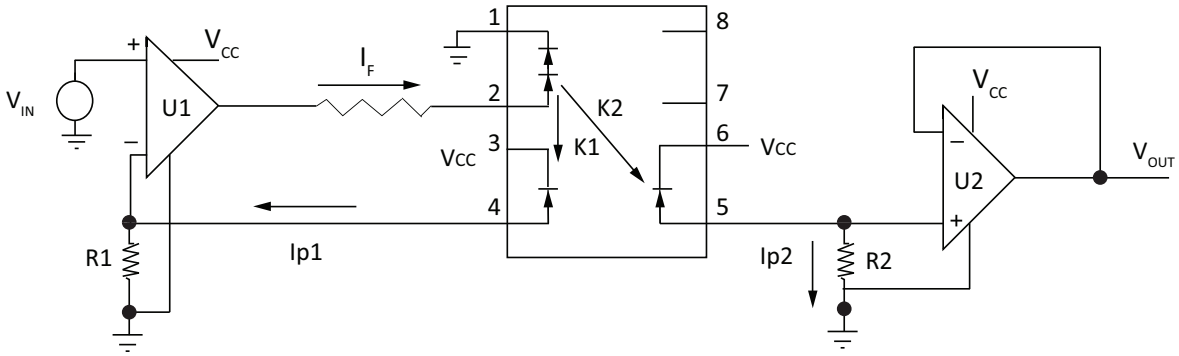


Figure 2. Switching Test Circuit



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*R2)/(K1*R1). Because (K2/K1) = K3, the circuit gain becomes K3 (R2/R1).

Figure 3. Typical Application Circuit

Typical Performance Characteristics (T_A = 25 °C, Unless Otherwise Indicated)

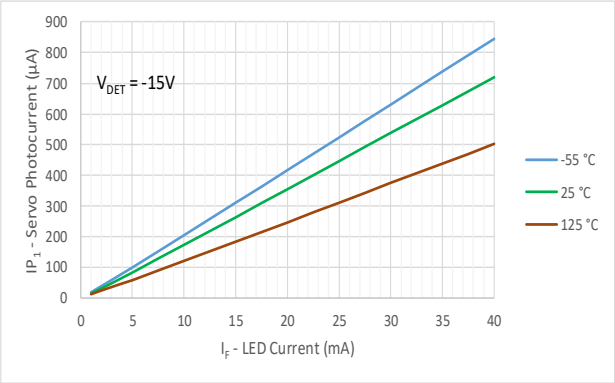


Figure 4. Servo Photocurrent vs. LED current

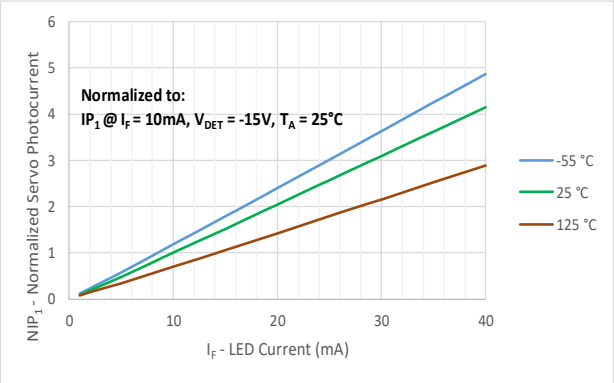


Figure 5. Normalized Servo Photocurrent vs. LED Current

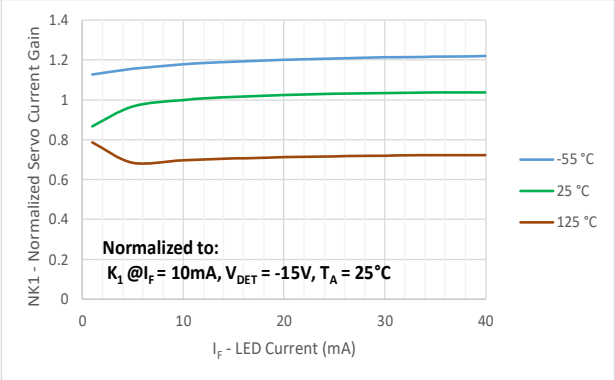


Figure 6. Normalized Servo Current Gain vs. LED Current

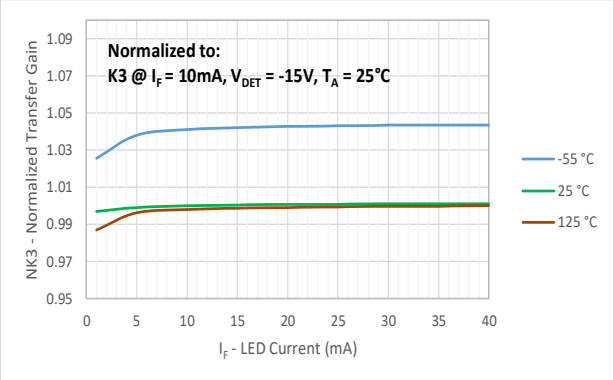


Figure 7. Normalized Transfer Gain vs. LED Current

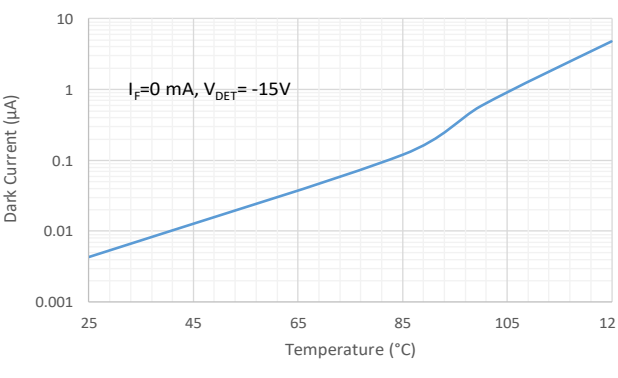


Figure 8. Dark Current vs. Temperature

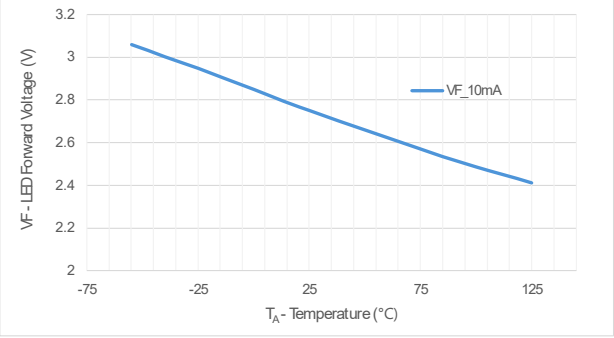


Figure 9. VF vs. IF

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.

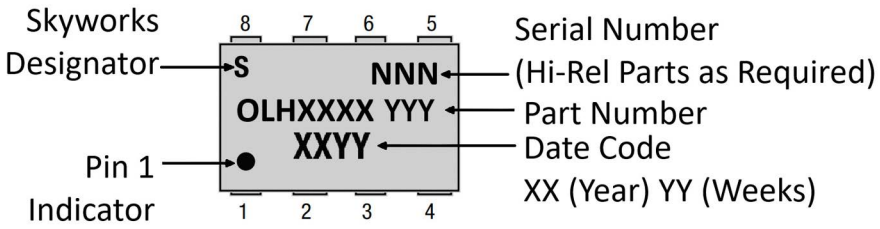


Figure 10. Typical Part Marking

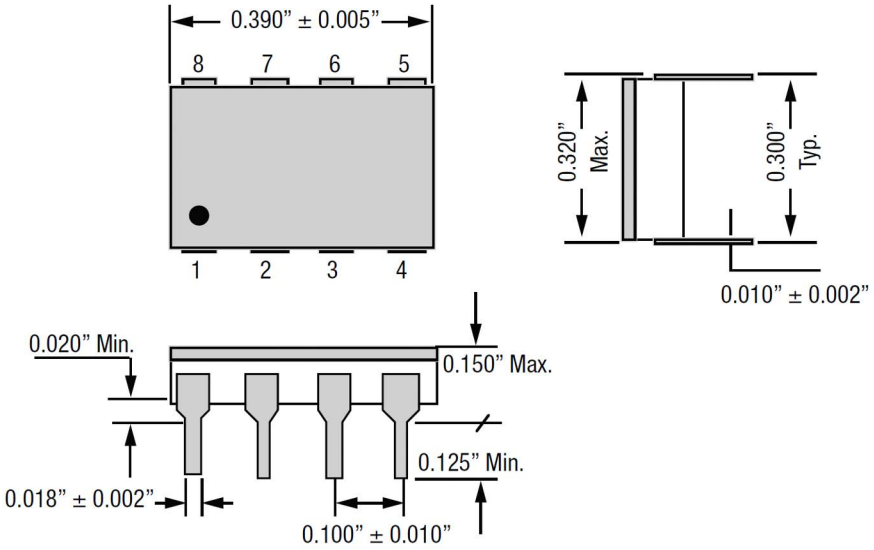
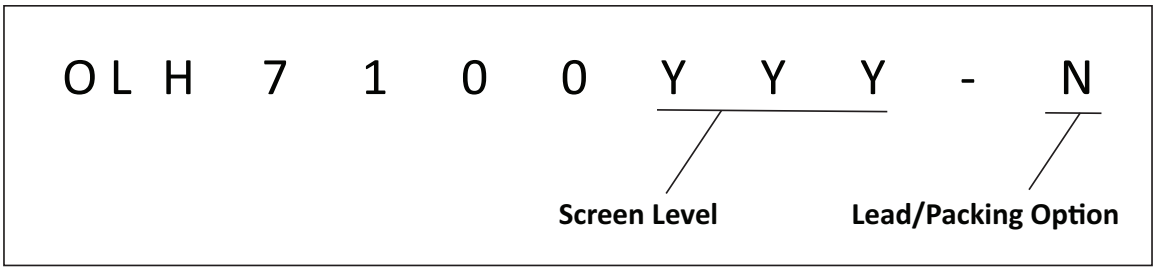


Figure 11. Package Dimensions

Table 4. Additional Package Information

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

Ordering Information



Screen Level	Hermetic 8-lead DIP (Single-Channel)
Catalog	OLH7100
MIL-STD-883 Class B equivalent	OLH7100SB
JANTX equivalent	OLH7100SX
JANTXV equivalent	OLH7100SXV
JANS equivalent	OLH7100PS
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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