Photologic Hermetic Sensors

OPL800, OPL800-OC, OPL801, OPL801-OC, OPL810, OPL810-OC, OPL811, OPL811-OC, OPL812-OC, OPL813-OC, OPL820, OPL820-OC, OPL821-OC

TT Electronics

Features:

- Four output options available
- High noise immunity
- Direct TTL/LSTTL interface
- TO-18 hermetically sealed package
- Sensors mechanically and spectrally matched to other Optek devices (see device descriptions detailed below)

Description:

All **OPL800**, **OPL801**, **OPL820** and **OPL821** sensors consist of a photodiode, a linear amplifier and a Schmitt trigger on a single silicon chip (monolithic chip for **OPL820** and **OPL821**). **OPL810**, **OPL811**, **OPL812** and **OPL813** sensors also have a voltage regulator added to their photologic chips. Each device's photologic chip is mounted onto a standard TO-18 header and hermetically sealed in a lensed metal can.

All devices in the series feature TTL/LSTTL compatible logic level output, which can drive up to 8 TTL loads (**OPL800**, **OPL801**) or up to 10 TTL loads (**OPL810**, **OPL811**, **OPL812**, **OPL813**, **OPL820** and **OPL821**) without additional circuitry. On all these devices, the Schmitt trigger's hysteresis characteristics provide high immunity to noise on input and V_{CC}.

OPL800 series devices feature medium-speed data rates to 250 kBaud, with typical rise and fall times of 25 nanoseconds.

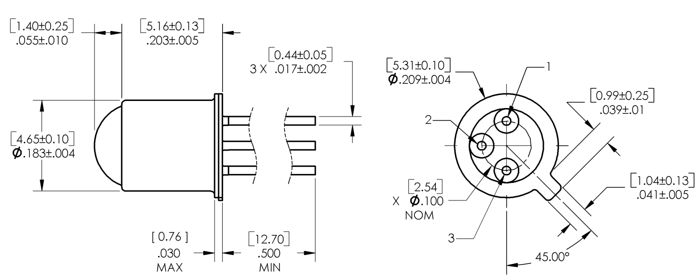
OPL800 and OPL801 devices are mechanically and spectrally matched to OP130 and OP231 series LEDs. OPL810, OPL811, OPL812 and OPL813 devices are mechanically and spectrally matched to OP130 and OP230 series devices. OPL820 and OPL821 devices are mechanically and spectrally matched to OP130 and OP231 series LEDs.

Applications:

- Non-contact reflective object sensor
- Assembly line automation
- Machine automation
- Machine safety
- End of travel sensor
- Door sensor

Pin #	OPL80_ or OPL81_	OPL82_	Transistor
1	Ground	Ground	Collector
2	V_{CC}	Output	Base
3	Output	V_{CC}	Emitter

Mounted to TO-18 Base



DIMENSIONS ARE IN: [MILLIMETERS]
INCHES

RoHS

General Note
TT Electronics reserves the right to make changes in product specification without notice or liability. All information is subject to TT Electronics' own data and is considered accurate at time of going to print.

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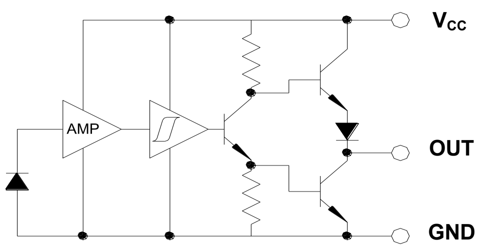
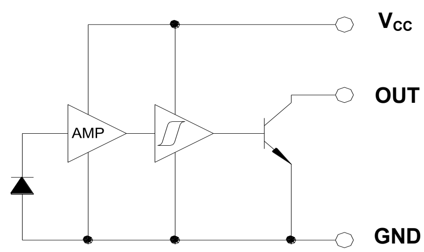
Ordering Information					
Part Number	**Photologic®**	**Input Power E_E ($\mu W/cm^2$) Min / Max**	**V_{CC} (V) Min / Max**	**I_{OH} / I_{OL}**	**Lead Length**
OPL800	Totem-Pole	50 / 600	4.5 / 16.0	0.10 / 12.8	0.50"
OPL800-OC	Open-Collector				
OPL801	Inv-Totem-Pole				
OPL801-OC	Inv-Open-Collector				
OPL810	Totem-Pole	5 / 100		0.10 / 16.0	
OPL810-OC	Open-Collector				
OPL811	Inv-Totem-Pole				
OPL811-OC	Inv-Open-Collector				
OPL812-OC	Open-Collector				
OPL813-OC	Inv-Open-Collector				
OPL820	10K Pull-Up	2 / 35			
OPL820-OC	Open Collector				
OPL821-OC	Inv. Open Collector				

OPL800, OPL800OC, OPL801, OPL801-OC, OPL810, OPL810-OC,
OPL811, OPL811-OC, OPL812-OC, OPL813-OC, OPL820-OC, OPL821-OC

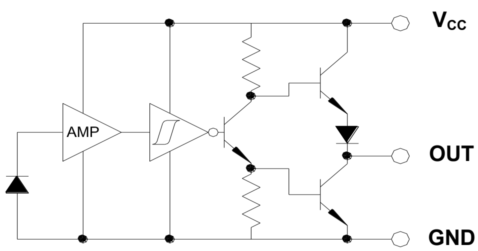
OPL800/800B/810 Buffered Totem-Pole



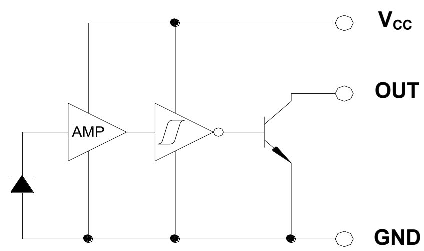
OPL800-OC/810-OC/812-OC/820/OC Open-Collector



OPL801/811 Inverted Totem-Pole



OPL801-OC/811-OC/813-OC/821-OC Inverted Open-Collector



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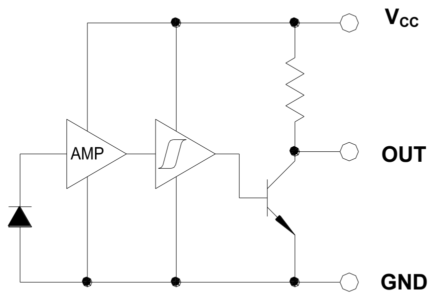
OPL820

OPL820 10K Pull-Up



Electrical Specifications

Absolute Maximum Ratings (T_A = 25° C unless otherwise noted) **OPB800/801/810/811 and OPB800-OC Series**	
Input Diode	
Operating Temperature Range OPL800, OPL801 OPL810, OPL811 OPL820	 -55° C to +110° C -55° C to +105° C -40° C to +100° C
Storage Temperature Range OPL800, OPL801 OPL810, OPL811 OPL820	 -65° C to +150° C -65° C to +125° C -55° C to +125° C
Lead Soldering Temperature [1/16 inch (1.6mm) from the case for 5 sec. with soldering iron]	260°C(1)
Input Infrared LED	
Supply Voltage, V_{CC} (not to exceed 3 seconds) OPL800, OPL801 OPL810, OPL811, OPL820	 10 V 18 V
Sourcing Current OPL810, OPL811	 10 mA
Output Voltage (high state) OPL800, OPL801, OPL810, OPL811 OPL820	 35 V 30 V
Output Current Sink (low state) OPL810, OPL811 OPL820	 50 mA 16 mA
Irradiance OPL800, OPL801 OPL810, OPL810-OC, OPL811, OPL811-OC OPL812, OPL812-OC, OPL813, OPL813-OC	 3 mW/cm^2 2 mW/cm^2 1 mW/cm^2

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Electrical Specifications

Absolute Maximum Ratings (T_A = 25° C unless otherwise noted) **OPB800/801/810/811/812/813 and OPB800-OC Series**	
Output Photologic®	
Voltage at Output Lead OPL800, OPL801, OPL810, OPL811 OPL820	 35 V 30 V
Duration of Output Short to V_{CC}	1 second
Power Dissipation OPL800, OPL801 OPL810, OPL811 OPL820	 120 mW(2) 250 mW(2) 200 mW(2)

Notes:

(1) RMA flux is recommended. Duration can be extended to 10 sec. max. when flow soldering. For OPB820, a maximum of 20 grams force may be applied to leads while at soldering temperatures.

(2) Derate linearly 2.5 mW/°C above 25° C for OPL800, OPL801, OPL810, OPL811. Derate linearly 5.7 mW/°C above 90° C for OPL820.

(3) For OPL800, OPL801, OPL810, OPL811, light measurements are made with λi = 935 nm. For OPB820, light measurements are made with an LED source having a wavelength of 935 nm.

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Electrical Specifications

Electrical Characteristics (T_A = 25° C unless otherwise noted)

SYMBOL	PARAMETER	MIN	TYP	MAX	UNITS	TEST CONDITIONS
V_{CC}	Operating Supply Voltage OPL800/801 OPL810/811 OP820	 4.5 4.5 4.5	 - - -	 5.5 16 16	 V V V	 - - -
	Peak-to-Peak V_{CC} Ripple Necessary to Cause False Triggering of Output OPL800/801 OPL810/811	 - -	 2 -	 - 1	 V V	 f = DC to 50 MHz f = DC to 50 MHz
I_{CC}	Supply Current	-	-	15	mA	E_e = 0 or 1 mW/cm^2
$E_{eT}^{(+)}$	Positive-Going Threshold Irradiance(3) OPL800/801 OPL810/811 OPL820	 0.050 0.015 0.002	 0.180 0.060 0.015	 0.600 0.200 0.035	 mW/cm^2 mW/cm^2 mW/cm^2	 T_A = 25°C T_A = 25°C See below(3)
$E_{eT}^{(+)}/E_{eT}^{(-)}$	Hysteresis Ratio OPL800/801 OPL810/811	 1.5 1.2	 2.0 1.5	 2.5 2.0	 - -	 - -
$E_e^{(+)}/E_e^{(-)}$	Hysteresis Ratio OPL820	 1.05	 1.20	 1.90	 -	 See below(3)
I_{CCH}	High State Supply Current OPL820	 -	 5	 12	 mA	 See below(4)
I_{CCL}	Low State Supply Current OPL820	 -	 4	 12	 mA	 See below(5)

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Electrical Specifications

Electrical Characteristics (T_A = 25° C unless otherwise noted)

SYMBOL	PARAMETER	MIN	TYP	MAX	UNITS	TEST CONDITIONS
V_{OH}	High Level Output Voltage					
	OPL800	2.4	-	-	V	I_{OH} = -800 µA, E_e = 1 mW/cm^2
	OPL801	2.4	-	-	V	I_{OH} = -800 µA, E_e = 0
	OPL810	V_{CC}-2.1	-	-	V	I_{OH} = -1mA, E_e = 0.4 mW/cm^2
	OPL811	V_{CC}-2.1	-	-	V	I_{OH} = -1mA, E_e = 0
	OPL820-OC/821-OC	V_{CC}-1.5	-	V_{CC}	V	I_{OH} = -100 µA$^{(4)}$

Notes:

(1) RMA flux is recommended. Duration can be extended to 10 sec. max. when flow soldering. For OPB820, a maximum of 20 grams force may be applied to leads while at soldering temperatures.

(2) Derate linearly 2.5 mW/°C above 25° C for OPL800, OPL801, OPL810, OPL811. Derate linearly 5.7 mW/°C above 90° C for OPL820.

(3) For OPL800, OPL801, OPL810, OPL811, light measurements are made with λi = 935 nm. For OPB820, light measurements are made with an LED source having a wavelength of 935 nm.

(4) High output state limits are valid for 4.5 V < V_{CC} < 16 V and E_e > 0.035 mW/cm^2 (OPL820, OPL820-OC), E_e < 0.001 mW/cm^2 (OPL821-OC).

(5) Low output state limits are valid for 4.5 V < V_{CC} < 16 V and E_e > 0.035 mW/cm^2 (OPL821-OC), E_e < 0.001 mW/cm^2 (OPL820, OPL820-OC).

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Electrical Specifications

Electrical Characteristics (T_A = 25° C unless otherwise noted)

SYMBOL	PARAMETER	MIN	TYP	MAX	UNITS	TEST CONDITIONS
V_{OH}	High Level Output Voltage		-			
	OPL800	2.4	-	-	V	I_{OH} = -800 µA, E_e = 1 mW/cm^2
	OPL801	2.4	-	-	V	I_{OH} = -800 µA, E_e = 0
	OPL810	V_{CC}-2.1	-	-	V	I_{OH} = -1mA, E_e = 0.4 mW/cm^2
	OPL811	V_{CC}-2.1	-	-	V	I_{OH} = -1mA, E_e = 0
	OPL820-OC/821-OC	V_{CC}-1.5	-	V_{CC}	V	I_{OH} = -100 µA$^{(4)}$
V_{OL}	Low Level Output Voltage					
	OPL800/800-OC	-	-	0.4	V	I_{OL} = 12.8 mA, E_e = 0
	OPL801/801-OC	-	-	0.4	V	I_{OL} = 12.8 mA, E_e = 1 mW/cm^2
	OPL810/810-OC	-	-	0.4	V	I_{OL} = 16 mA, E_e = 0
	OPL811/811-OC	-	-	0.4	V	I_{OL} = 16 mA, E_e = 0.4 mW/cm^2
	OPL812-OC	-	-	0.4	V	I_{OL} = 16 mA, E_e = 0
	OPL813-OC	-	-	0.4	V	I_{OL} = 16 mA, E_e = 0.2 mW/cm^2
	OPL820	-	-	0.4	V	I_{OL} = 16 mA$^{(5)}$
I_{OH}	High Level Output Current					
	OPL800-OC	-	-	100	µA	V_{OH} = 30 V, E_e = 2 mW/cm^2
	OPL801-OC	-	-	100	µA	V_{OH} = 30 V, E_e = 0
	OPL810-OC	-	-	100	µA	V_{OH} = 30 V, E_e = 0.4 mW/cm^2
	OPL811-OC	-	-	100	µA	V_{OH} = 30 V, E_e = 0
	OPL812-OC	-	-	100	µA	V_{OH} = 30 V, E_e = 0.2 mW/cm^2
	OPL813-OC	-	-	100	µA	V_{OH} = 30 V, E_e = 0
I_{OS}	Short Circuit Output Current					
	OPL800	-20			mA	E_e = 1 mW/cm^2, Output = GND
	OPL801	-		-100	mA	E_e = 0, Output = GND

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Electrical Characteristics (T_A = 25° C unless otherwise noted)

SYMBOL	PARAMETER	MIN	TYP	MAX	UNITS	TEST CONDITIONS
t_r, t_f	Output Rise Time, Fall Time					
	OPL800/801	-	70	-	ns	T_A = 25°C, E_e = 0 or 1 mW/cm^2, R_L = 8 TTL loads, f = 10 kHz, D.C. = 50%
	OPL800-OC/801-OC	-	70	-	ns	T_A = 25°C, E_e = 0 or 1 mW/cm^2, R_L = 360 Ω, f = 10 kHz, D.C. = 50%
	OPL810/811	-	70	-	ns	T_A = 25°C, E_e = 0 or 0.4 mW/cm^2, R_L = 10 TTL loads, f = 10 kHz, D.C. = 50%
	OPL810-OC/811-OC/812-OC/813-OC	-	100	-	ns	T_A = 25°C, E_e = 0 or 1 mW/cm^2, R_L = 300 Ω, f = 10 kHz, D.C. = 50%
	OPL820	-	60	-	ns	RL = 390Ω
t_{PLH}, t_{PHL}	Propagation Delay Low/High - High/Low					
	OPL800/801	-	5	-	µs	T_A = 25°C, E_e = 0 or 1 mW/cm^2, R_L = 8 TTL loads, f = 10 kHz, D.C. = 50%
	OPL800-OC/801-OC	-	5	-	µs	T_A = 25°C, E_e = 0 or 1 mW/cm^2, R_L = 8 TTL loads, f = 10 kHz, D.C. = 50%
	OPL810/811	-	5	-	µs	T_A = 25°C, E_e = 0 or 0.4 mW/cm^2, R_L = 10 TTL loads, f = 10 kHz, D.C. = 50%
	OPL810-OC/811-OC/812-OC/813-OC	-	5	-	µs	T_A = 25°C, E_e = 0 or 1 mW/cm^2, R_L = 300 Ω, f = 10 kHz, D.C. = 50%
	OPL820 (to high state)	-	1	-	µs	E_E = 0.1 mW/cm^2, RL = 390 Ω
	OPL820 (to low state)	-	2.1	-	µs	E_E = 01 mW/cm^2, RL = 390 Ω
Data Rate	Data Rate Using NRZ Format	-	100	-	kHz	E_E = 01 mW/cm^2, RL = 390 Ω

Notes:

(1) RMA flux is recommended. Duration can be extended to 10 sec. max. when flow soldering. For OPB820, a maximum of 20 grams force may be applied to leads while at soldering temperatures.

(2) Derate linearly 2.5 mW/°C above 25° C for OPL800, OPL801, OPL810, OPL811. Derate linearly 5.7 mW/°C above 90° C for OPL820.

(3) For OPL800, OPL801, OPL810, OPL811, light measurements are made with λi = 935 nm. For OPB820, light measurements are made with an LED source having a wavelength of 935 nm.

(4) High output state limits are valid for 4.5 V < V_{CC} < 16 V and E_e > 0.035 mW/cm^2 (OPL820, OPL820-OC), E_e < 0.001 mW/cm^2 (OPL821-OC).

(5) Low output state limits are valid for 4.5 V < V_{CC} < 16 V and E_e > 0.035 mW/cm^2 (OPL821-OC), E_e < 0.001 mW/cm^2 (OPL820, OPL820-OC).

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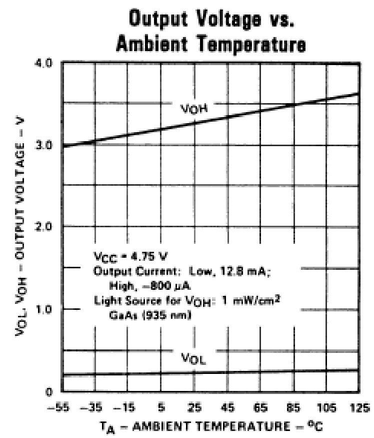
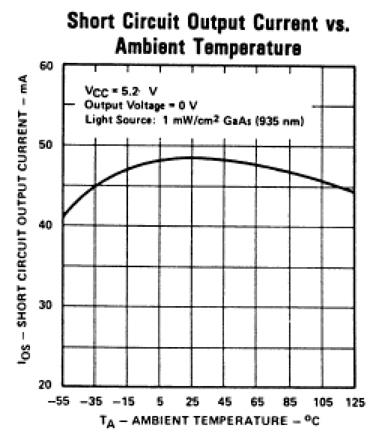
Photologic Hermetic Sensors

OPL800, OPL800-OC, OPL801, OPL801-OC, OPL810, OPL810-OC, OPL811, OPL811-OC, OPL812-OC, OPL813-OC, OPL820, OPL820-OC, OPL821-OC

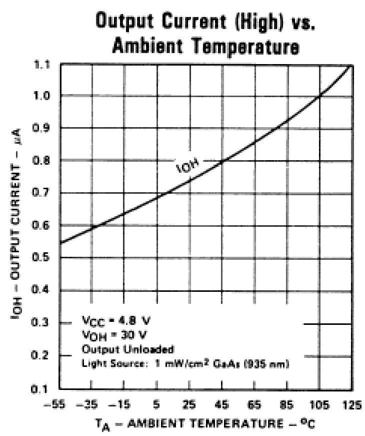
Performance

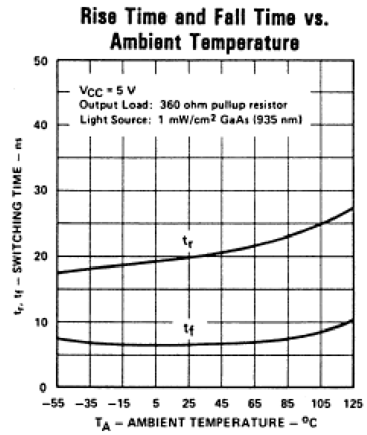
OPL800, OPL801



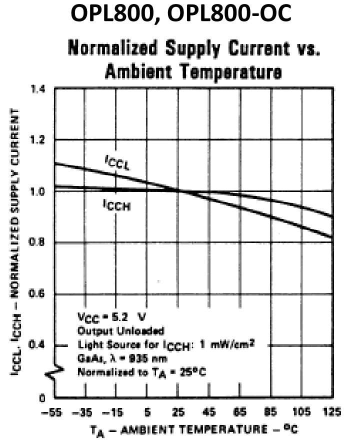


OPL800-OC, OPL801-OC

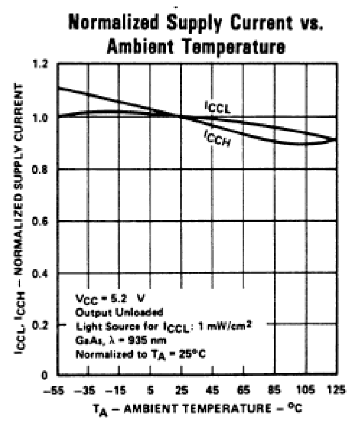




OPL800, OPL800-OC



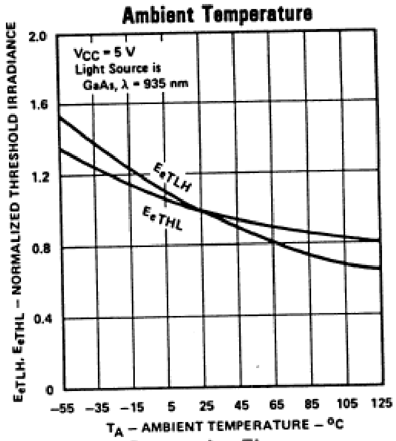
OPL801, OPL801-OC



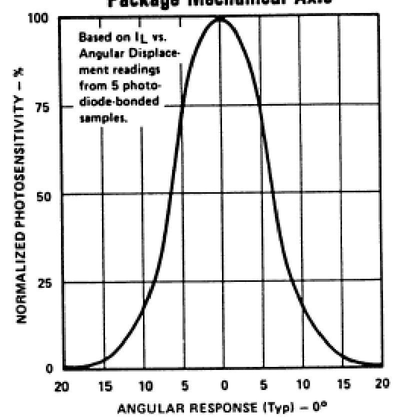
Performance

OPL800, OPL801 Series

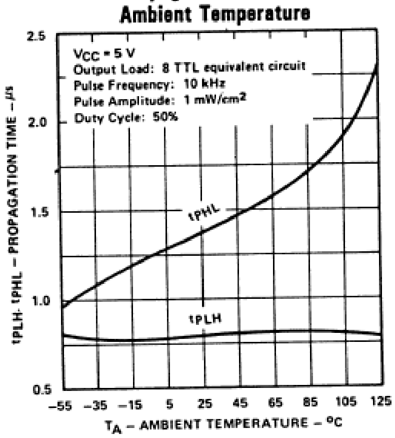
Normalized Threshold Irradiance vs. Ambient Temperature



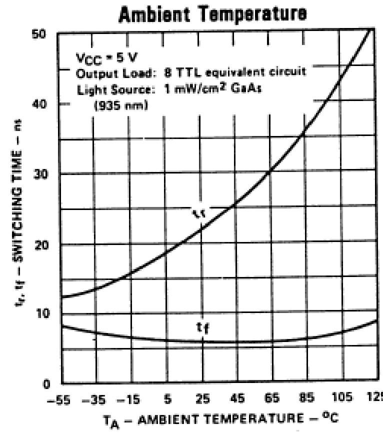
Angular Displacement from Package Mechanical Axis



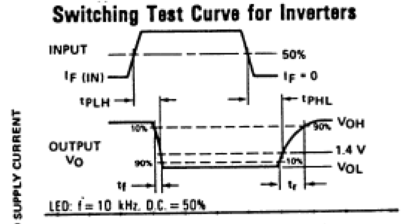
Propagation Time vs. Ambient Temperature



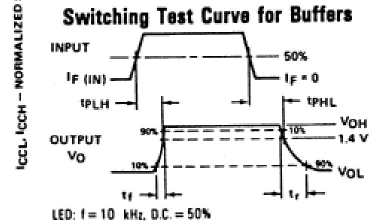
Rise Time and Fall Time vs. Ambient Temperature



Switching Test Curve for Inverters



Switching Test Curve for Buffers

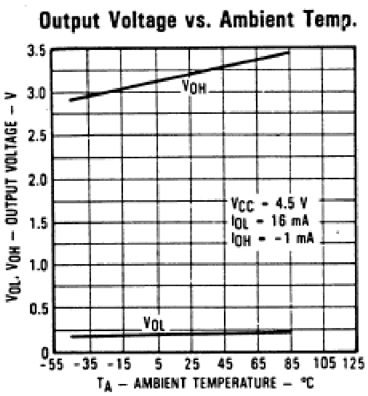


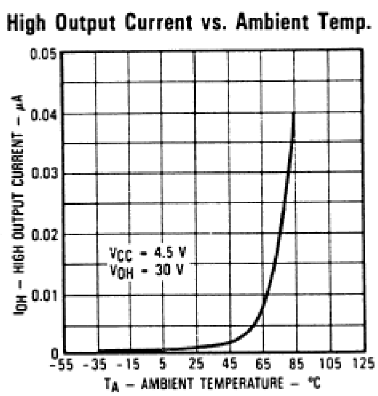
Photologic Hermetic Sensors

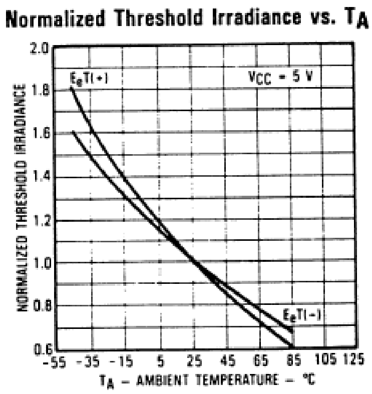
OPL800, OPL800-OC, OPL801, OPL801-OC, OPL810, OPL810-OC, OPL811, OPL811-OC, OPL812-OC, OPL813-OC, OPL820, OPL820-OC, OPL821-OC

Performance

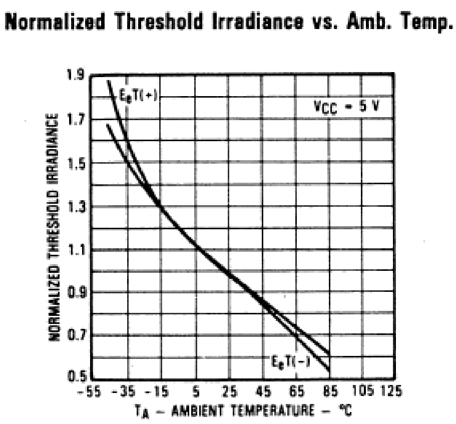
OPL810, OPL811 Series

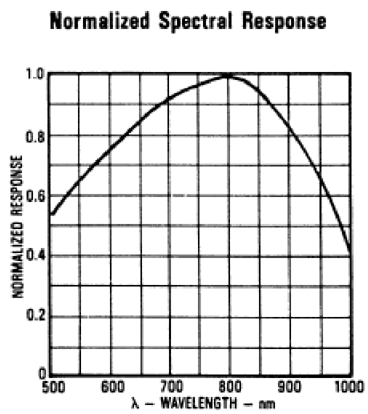


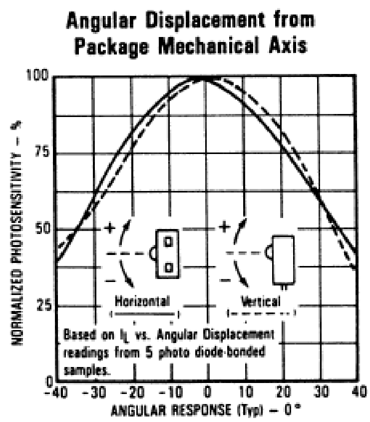




OPL812, OPL813 Series







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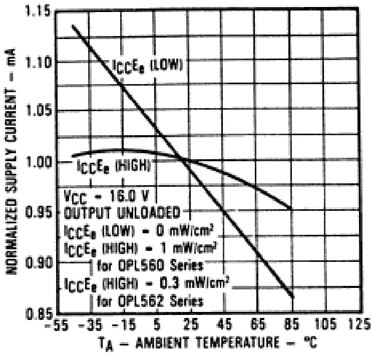
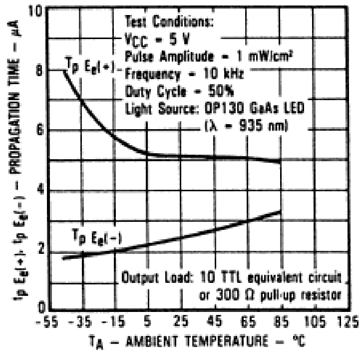
Performance

OPL812, OPL813 Series

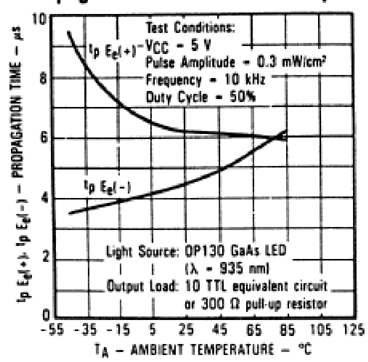
Normalized Supply Current vs. Ambient Temperature



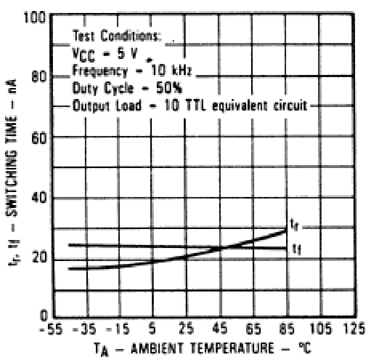
Propagation Time vs. Amb. Temp.



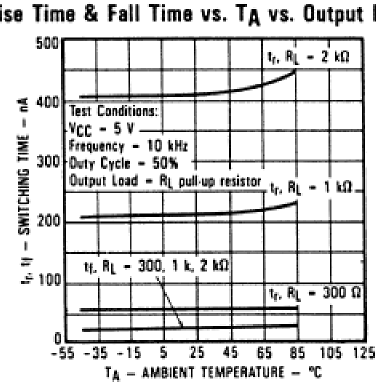
Propagation Time vs. Amb. Temp.



Rise Time & Fall Time vs. T_A

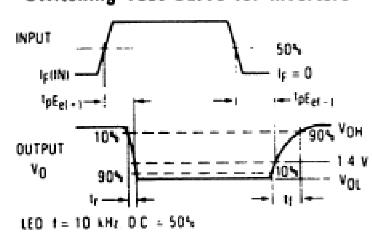


Rise Time & Fall Time vs. T_A vs. Output Load

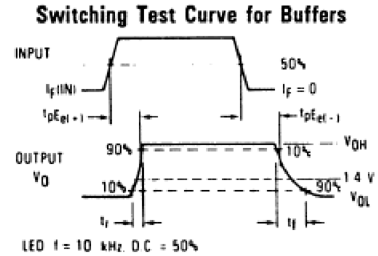


Switching Test Curves

Switching Test Curve for Inverters



Switching Test Curve for Buffers



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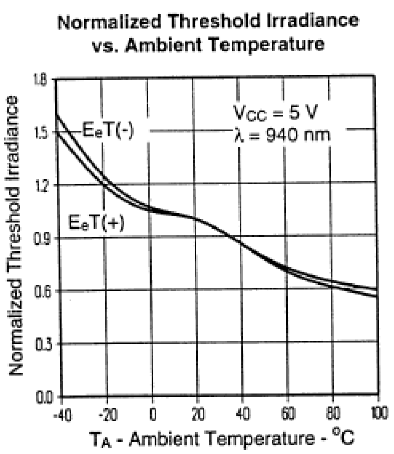
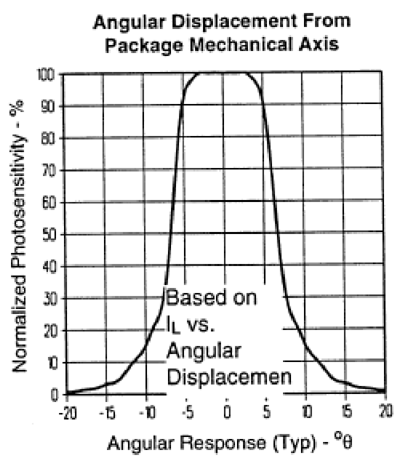
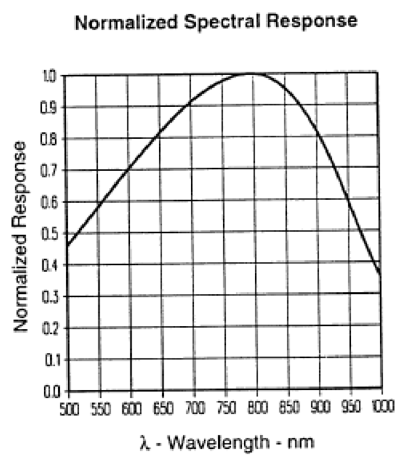
Performance

OPL820, OPL821 Series

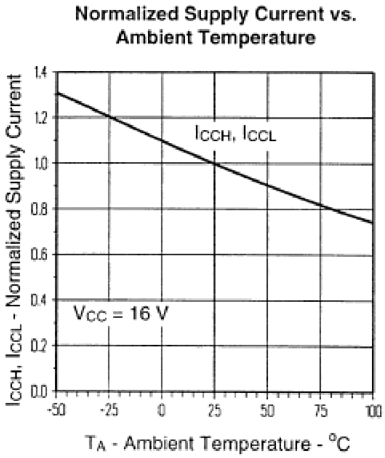


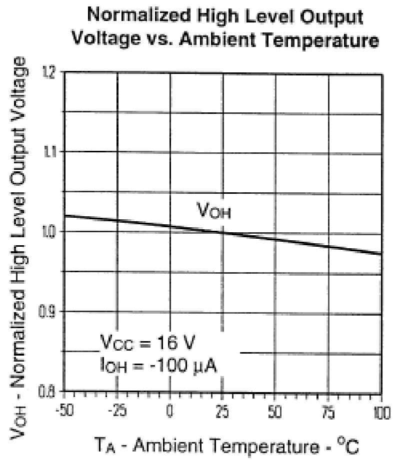


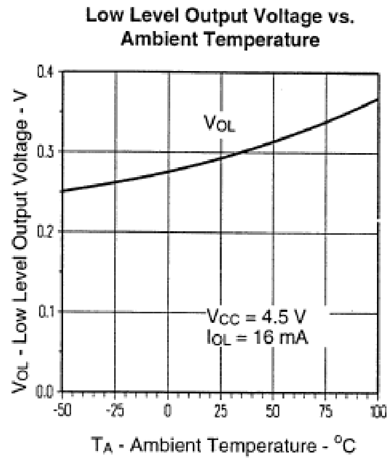


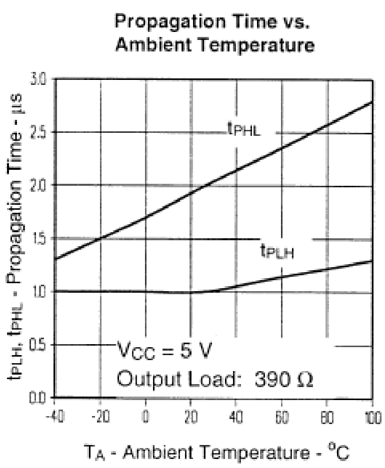
Performance

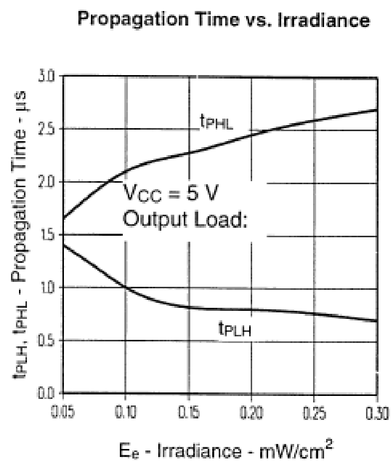
OPL820, OPL821 Series











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