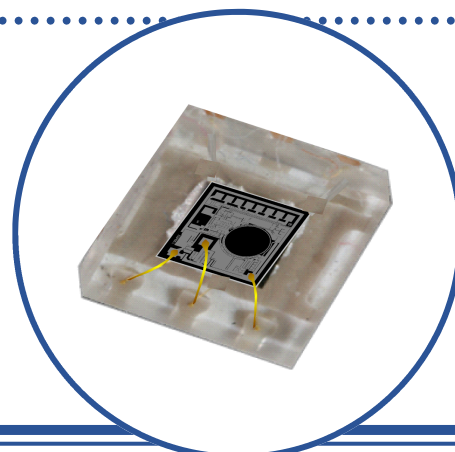


# SMD Photologic® Sensor

## OPL611 Through OPL615

### Features:

- High noise immunity
- Small Package Outline: 3mm x 3mm (H = 1mm)
- Choice of two device types:
  1. Buffer
  2. Inverter
- Choice of two output options with each device type:
  1. Open Collector
  2. 10K Pull-Up
- Direct TTL/LSTTL CMOS interface
- Data rates to 250kBaund
- Vcc from 4.5 to 16V<sub>DC</sub>



### Description:

The OPL611 – OPL615 is a low cost, small surface mount packaged photo light sensor with a digital output suitable for applications with limited space such as portable applications. All devices in the series have a Photologic® chip that is encapsulated in a molded plastic surface mount package, which provides optical coupling combined with mechanical protection. The hysteresis characteristics of the Schmitt trigger on each device offers high immunity to noise on input and V<sub>CC</sub>. There are two output options for both the buffer and inverter versions, and all operate with a power supply voltage range from 4.5V to 16V.

- **OPL611 through OPL615:** Are mechanically and spectrally matched to the OP180, OP200, OP250 series, OP270 series and OP280 series LED's.

\*Contact your OPTEK sales representatives for those special requirements to meet your needs.

### Applications:

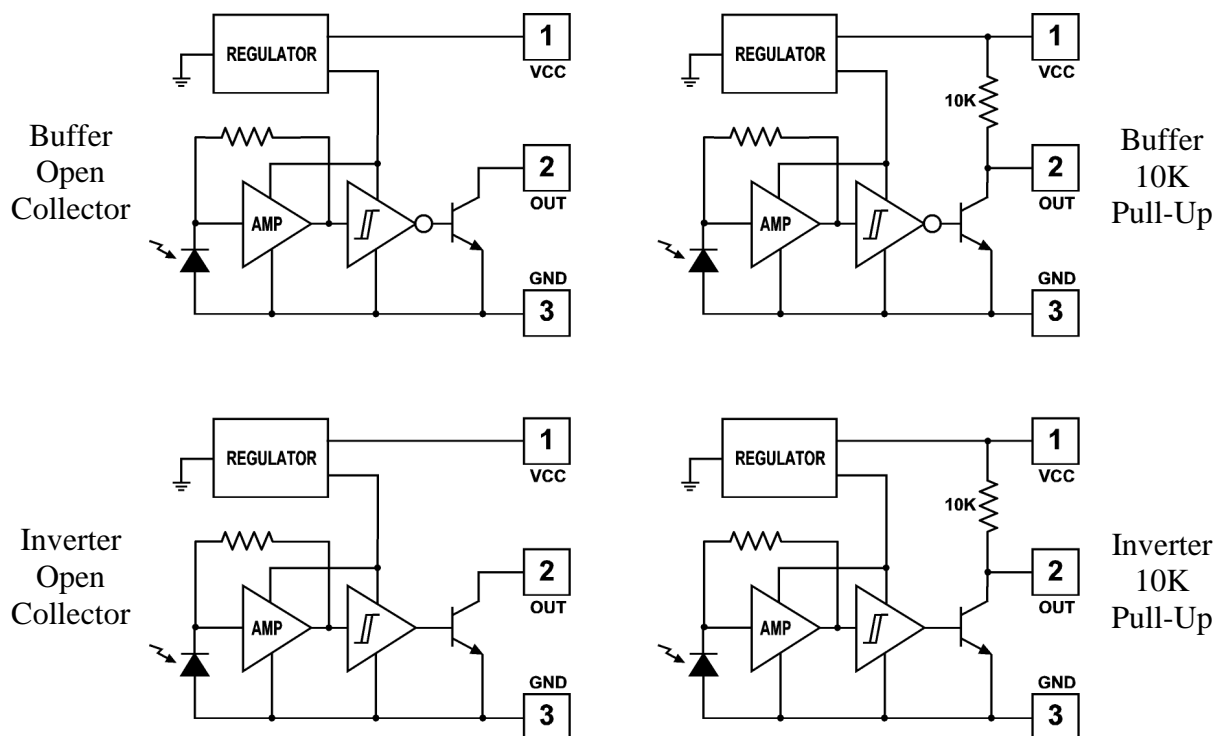
- Encoder
- Non-contact reflective object sensor
- Non-contact interruptive sensing
- Assembly line automation
- Machine automation
- Machine safety
- End of travel sensor
- Object sensor
- Paper sensor

Base Part Number	Package	Output Type - With Light	Minimum Input Power Range
OPL611	SMD (DFN6L)	Buffer (Internal) 10K Pull-Up	1.0 (mW/cm <sup>2</sup> )
OPL612		Buffer Open Collector	
OPL614		Inverter (Internal) 10K Pull-Up	
OPL615		Inverter Open Collector	
Note: Buffer = Output is high with light. Inverter = Output is low with light.			



OPTEK reserves the right to make changes at any time in order to improve design and to supply the best product possible.

### Block Diagram



(Note: BUFFER = Output is high with light. INVERTER = Output is low with light.)

### Absolute Maximum Ratings

#### Maximum Operating Conditions ( $T_A=25^\circ\text{C}$ unless otherwise noted)

DC Supply Voltage ( $V_{CC}$ )	4.5V to 18V
Operating Temperature Range	-40°C to + 85°C
Storage Temperature Range	-55°C to + 100°C
$I_{CC}$	10mA
Power Dissipation <sup>(1)</sup>	90mW
Sinking Current	25mA
Voltage at Output Lead ( <i>OPL612 and OPL615</i> )	30V
Duration of Output Short to $V_{CC}$ or Ground	1 second
Irradiance <sup>(2)</sup>	3mW/cm <sup>2</sup>
ESD ( <i>Human Body Model</i> )	5KV

Notes:

- (1) Derate linearly 1.0mW/°C above 25°C
- (2) Irradiance measurements are made with,  $\lambda = 890\text{nm}$ .

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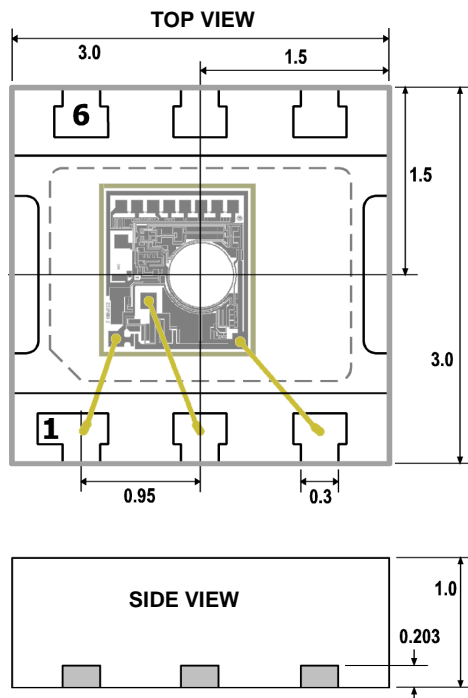
## Electrical Characteristics

**Electrical Characteristics** ( $T_A = 25^\circ\text{C}$  unless otherwise noted) (Light Source:  $\lambda = 890\text{nm} \pm 10\text{nm}$ )

SYMBOL	PARAMETER	MIN	TYP	MAX	UNITS	TEST CONDITIONS
$V_{CC}$	Operating Supply Voltage	4.5	-	16	V	-
$I_{CC}$	Supply Current	1.0	3.8	7	mA	$V_{CC} = 4.5\text{V to }16\text{V}$
$E_{eT(+)}$	Positive-Going Threshold Irradiance	0.15	0.25	0.40	mW/cm <sup>2</sup>	$V_{CC} = 5\text{V}$
$E_{eT(+)} / E_{eT(-)}$	Hysteresis Ratio	1.1	1.4	1.6	-	$V_{CC} = 5\text{V}$
$\Delta E_{eT(+)} / (\Delta T)$	Temperature Co-efficient	-	-0.6	-	%/°C	$V_{CC} = 5\text{V}, -40^\circ\text{C to }+85^\circ\text{C}$
$V_{OH}$	High Level Output Voltage	$V_{CC} - 2$	$V_{CC} - 1$	-	V	$V_{CC} = 4.5\text{V to }16\text{V}, I_{OH} = -100\mu\text{A}$ $E_e = 3\text{mW/cm}^2$ (OPL611) $E_e = 0\text{mW/cm}^2$ (OPL614)
$V_{OL}$	Low Level Output Voltage	-	300	400	mV	$V_{CC} = 4.5\text{V to }16\text{V}, I_{OL} = 16\text{mA}$ $E_e = 0\text{mW/cm}^2$ (OPL611 and OPL612) $E_e = 3\text{mW/cm}^2$ (OPL614 and OPL615)
$I_{OH}$	High Level Output Current	-	-	10	$\mu\text{A}$	$V_{CC} = 16\text{V}, V_{OUT} = 30\text{V}$ $E_e = 3\text{mW/cm}^2$ (OPL612) $E_e = 0\text{mW/cm}^2$ (OPL615)
$t_r$	Output Rise Time	-	90	-	ns	$V_{CC} = 5\text{V}, \text{Freq.} = 100\text{kHz},$ $R = 1\text{K}, C < 10\text{pF}, E_e = 3\text{mW/cm}^2.$ Decouple Cap ( $V_{CC}$ to GND) = 0.1 $\mu\text{F}$
$t_f$	Output Fall Time	-	50	-	ns	$V_{CC} = 5\text{V}, \text{Freq.} = 100\text{kHz},$ $R = 1\text{K}, C < 10\text{pF}, E_e = 3\text{mW/cm}^2.$ Decouple Cap ( $V_{CC}$ to GND) = 0.1 $\mu\text{F}$
$tpE_{eT(+)}$	Propagation Delay (Low to High)	-	0.4	-	$\mu\text{s}$	$V_{CC} = 5\text{V}, \text{Freq.} = 100\text{kHz},$ $R = 1\text{K}, C < 10\text{pF}, E_e = 3\text{mW/cm}^2.$ Decouple Cap ( $V_{CC}$ to GND) = 0.1 $\mu\text{F}$
$tpE_{eT(-)}$	Propagation Delay (High to Low)	-	1.6	-	$\mu\text{s}$	$V_{CC} = 5\text{V}, \text{Freq.} = 100\text{kHz},$ $R = 1\text{K}, C < 10\text{pF}, E_e = 3\text{mW/cm}^2.$ Decouple Cap ( $V_{CC}$ to GND) = 0.1 $\mu\text{F}$

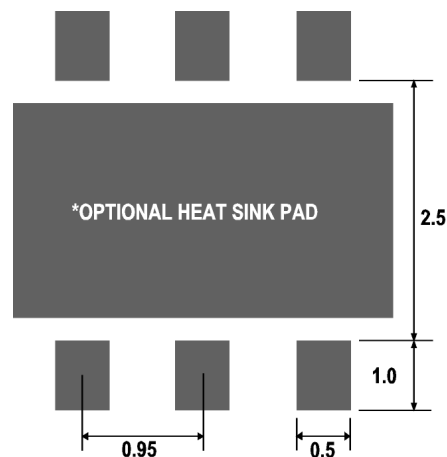
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### OPL600 Series (Package Outline)



Pin	Function
1	Vcc
2	Vout
3	GND
4	NC
5	NC
6	NC

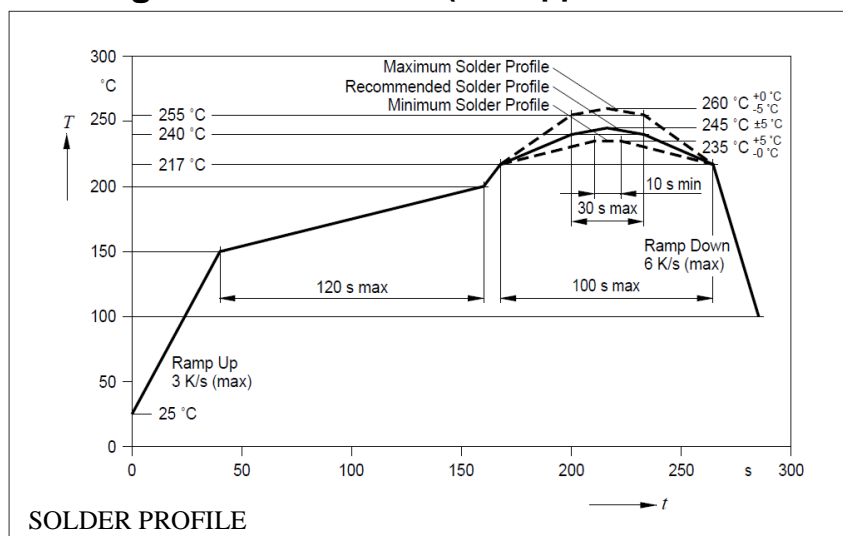
#### SOLDER PAD LAYOUT



**Note(s):**

Dimensions are in millimeters.  
If used, connect heat sink pad to GND.  
ESD rating is the human body model.  
Moisture rating is level 3.

### Handling Considerations (see Application Bulletin 237)



To combat moisture, Optek bakes all our devices in a 100°C environment for 24 hours prior to inserting them into the shipping tubes and sealing them in airtight bags. Once removing parts from their shipping bags, customers are strongly encouraged to solder the devices within four (4) hours. Exposing the parts to humidity for longer than four (4) hours prior to soldering will require the customer to subject the parts to a 24 hour bake at 100°C prior to use. If the parts will experience future soldering operations, housing the parts in a dry box or similar environment is encouraged. Also, it is acceptable to bake the parts multiple times if there are multiple soldering operations and a dry environment cannot be maintained. Once all soldering operations are completed, exposing the parts to humidity is acceptable.

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## Reliability Test Results

### Stress results

Test	Test Conditions	Device Hrs./Cycles	Devices Tested	Average Degrad %	Failures <sup>(1)</sup>
Operating Life (OL)	T <sub>A</sub> = 25°C, I <sub>F</sub> = 20mA, 1008 hrs	1099 hrs	40	I <sub>CC</sub> = 0.6%; I <sub>(OL)</sub> = -1.4%	0
High Temperature Operating Life (HTOL)	T <sub>A</sub> = 85°C; 1008 hrs; V <sub>CC</sub> = 18V	1008 hrs	20	I <sub>CC</sub> = 0.6%; I <sub>(OL)</sub> = -1.4%	0
High Temperature Storage (HT)	T <sub>H</sub> = 105°C; 1008 hrs	1008 hrs	26	I <sub>CC</sub> = 0.6%; I <sub>(OL)</sub> = -1.4%	0
Low Temperature Storage (LT)	T <sub>L</sub> = -40°C; 1008 hrs	1008 hrs	24	I <sub>CC</sub> = 0.4%; I <sub>(OL)</sub> = -0.8%	0
HAST—unbiased / Temperature & Humidity	85°C/85% R.H.; 168 hrs	168 hrs	20	I <sub>CC</sub> = 0.4% I <sub>(OL)</sub> = -0.006%	0
Air-to-Air Thermal Shock (I)	-40°C to 105°C, 6 sec transfer rate, 10 min extremes	100 cycles	25	I <sub>CC</sub> = 0.46%; I <sub>(OL)</sub> = -4.79%	0
Air-to-Air Thermal Shock (II)	-55°C to 125°C, 6 sec transfer rate, 10 min extremes	100 cycles	25	I <sub>CC</sub> = -3.55%; I <sub>(OL)</sub> = -3.82%	0

Notes:

- (1) End point failure criteria is catastrophic failure or if coupled sensitivity changes by greater than 50%.

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