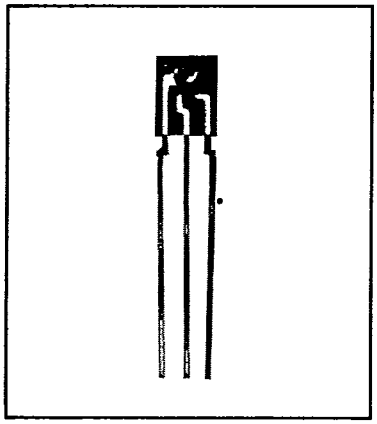
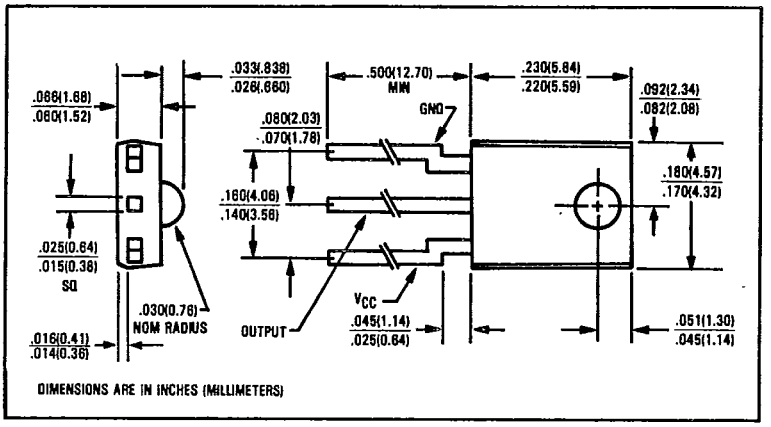
Optoelectronics Division
TRW Electronic Components Group

Product Bulletin 5154
January 1985

Photologic™ Plastic Sensors
Types OPL550, OPL550-OC, OPL551, OPL551-OC, SLB, SLA





Features
- Four output options
- High noise immunity
- Direct TTL/LSTTL interface
- Low cost plastic side looking package
- Mechanically and spectrally matched to OP140SL and OP240SL series LEDs
- Data rates to 250 K-baud

Description
The OPL550, OPL550-OC, OPL551, and OPL551-OC contain a monolithic integrated circuit which incorporates a photodiode, a linear amplifier and a Schmitt trigger on a single silicon chip. The devices feature TTL/LSTTL compatible logic level output which can drive up to 8 TTL loads without additional circuitry. Also featured are medium speed data rates to 250 K-baud with typical rise and fall times of 25 nsec. The Schmitt trigger's hysteresis characteristics provide high immunity to noise on input and V_{CC}. The Photologic™ chip is encapsulated in a molded plastic package which has an integral lens for enhanced optical coupling. These devices are mechanically and spectrally matched to the OP140SL and OP240SL infrared emitting diodes.

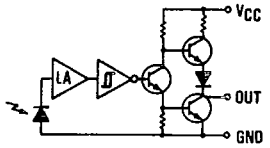
Absolute Maximum Ratings (T_A=25°C unless otherwise noted)

Supply Voltage, V_{CC} (not to exceed 3 seconds)	+10.0 V
Storage Temperature Range	−40°C to +100°C
Operating Temperature Range	−40°C to +85°C
Lead Soldering Temperature (1/16 inch [1.6 mm] from case for 5 sec. with soldering iron)	240°C(1)
Power Dissipation	85 mW(2)
Duration of Output Short to V_{CC} or Ground (OPL550, OPL551)	1.00 sec.
Duration of Output Short to V_{CC} (OPL550-OC, OPL551-OC)	1.00 sec.
Voltage at Output Lead (OPL550-OC, OPL551-OC)	35 V
Low Level Output Current	16.0 mA
High Level Output Current (OPL550, OPL551)	1.00 mA
Irradiance	25 mW/cm²

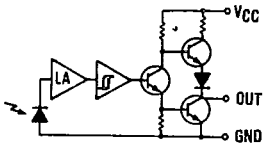
Notes:
(1) RMA flux is recommended. Duration can be extended to 10 seconds max. when flow soldering.
(2) Derate linearly 4.25 mW/°C above 80°C.

Schematics

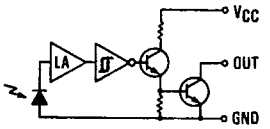
OPL550 (Totem-Pole Output) Buffer



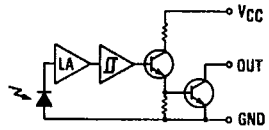
OPL551 (Totem-Pole Output) Inverter



OPL550-OC (Open-Collector Output) Buffer



OPL551-OC (Open-Collector Output) Inverter



Types OPL550, OPL550-OC, OPL551, OPL551-OC, SLB, SLA

T-41-69

Electrical Characteristics (−40°C to +85°C unless otherwise noted)

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
V_{CC}	Operating Supply Voltage	4.5		5.5	V	
	Peak-to-Peak V_{CC} Ripple Necessary to Cause False Triggering of Output		2.0		V	V_{CC} = 5.0 VDC f = DC to 50 MHz
$E_eT(+)$	Positive-Going Threshold Irradiance OPL550, OPL550-OC, OPL551, OPL551-OC OPL550SLA, OPL550-OCSLA, OPL551SLA, OPL551-OCSLA OPL550SLB, OPL550-OCSLB, OPL551SLB, OPL551-OCSLB	 .25 .25 .65		 2.4 1.40 1.90	 mW/cm² mW/cm² mW/cm²	 V_{CC} = 5.0 V V_{CC} = 5.0 V V_{CC} = 5.0 V
$E_eT(+)/E_eT(-)$	Hysteresis Ratio	1.50	2.0	3.0		
I_{CC}	Supply Current		8.0	15.0	mA	V_{CC} = 5.5 V, E_e = 0 or 3.0 mW/cm²

OPL550 (Buffer, Totem-Pole)

V_{OH}	High Level Output Voltage	2.4	3.3		V	V_{CC} = 4.5 V, I_{OH} = −800 μA, E_e = 3.0 mW/cm²
V_{OL}	Low Level Output Voltage		.25	0.40	V	V_{CC} = 4.5 V, I_{OL} = 12.8 mA, E_e = 0
I_{OS}	Short Circuit Output Current	−20	−55	−100	mA	V_{CC} = 5.5 V, E_e = 3.0 mW/cm², Output = GND

OPL550-OC (Buffer, Open-Collector)

I_{OH}	High Level Output Current		1.00	100	μA	V_{CC} = 4.5 V, V_{OH} = 30 V, E_e = 3.0 mW/cm²
V_{OL}	Low Level Output Voltage		.25	0.40	V	V_{CC} = 4.5 V, I_{OL} = 12.8 mA, E_e = 0

OPL551 (Inverter, Totem-Pole)

V_{OH}	High Level Output Voltage	2.4	3.3		V	V_{CC} = 4.5 V, I_{OH} = −800 μA, E_e = 0
V_{OL}	Low Level Output Voltage		.25	0.40	V	V_{CC} = 4.5 V, I_{OL} = 12.8 mA, E_e = 3.0 mW/cm²
I_{OS}	Short Circuit Output Current	−20	−55	−100	mA	V_{CC} = 5.5 V, E_e = 0, Output = GND

OPL551-OC (Inverter, Open-Collector)

I_{OH}	High Level Output Current		1.00	100	μA	V_{CC} = 4.5 V, V_{OH} = 30 V, E_e = 0
V_{OL}	Low Level Output Voltage		.25	0.40	V	V_{CC} = 4.5 V, I_{OL} = 12.8 mA, E_e = 3.0 mW/cm²

OPL550, OPL551

t_r, t_f	Output Rise Time, Output Fall Time		25	70	ns	V_{CC} = 5.0 V, T_A = 25°C, E_e = 0 or 3.0 mW/cm² f = 10.0 kHz, D.C. = 50%, R_L = 8 TTL Loads
t_{PLH},t_{PHL}	Propagation Delay, Low-High, High-Low		2.5	5.0	μs	

OPL550-OC, OPL551-OC

t_r, t_f	Output Rise Time, Output Fall Time		25	70	ns	V_{CC} = 5.0 V, T_A = 25°C, E_e = 0 or 3.0 mW/cm² f = 10.0 kHz, D.C. = 50%, R_L = 360Ω
t_{PLH},t_{PHL}	Propagation Delay, Low-High, High-Low		2.5	5.0	μs	

Note: (1) Irradiance measurements are made with λ_i = 935 nm, through an aperture .020×.060, centered on the lens, parallel to the leads, and flush +.005 to the lens surface.

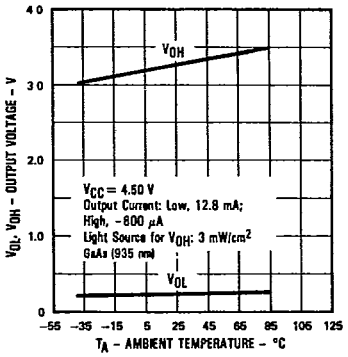
D

Types OPL550, OPL550-OC, OPL551, OPL551-OC, SLB, SLA

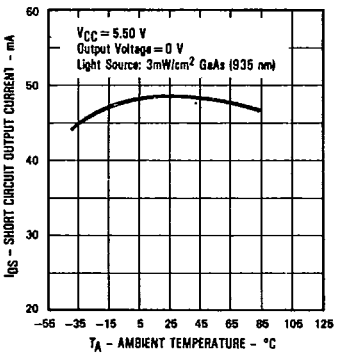
Typical Performance Curves

OPL550, OPL551

Output Voltage vs. Ambient Temperature

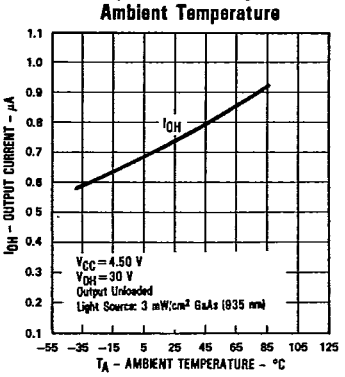


Short Circuit Output Current vs. Ambient Temperature

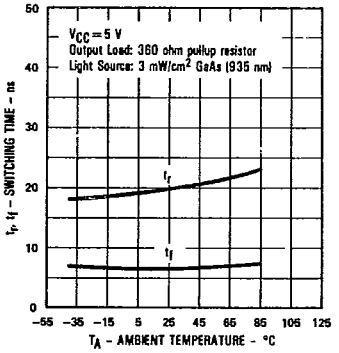


OPL550-OC, OPL551-OC

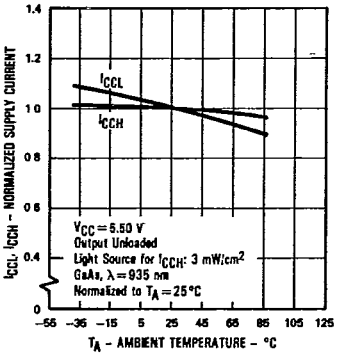
Output Current (High) vs Ambient Temperature



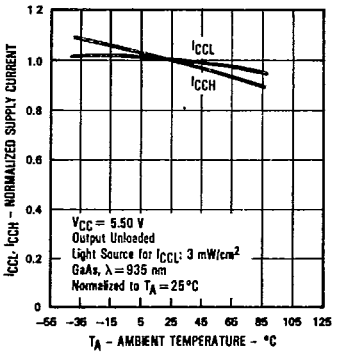
Rise Time and Fall time vs Ambient Temperature



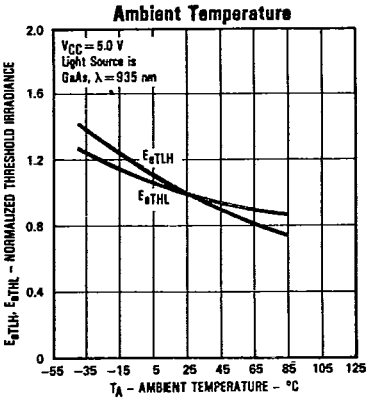
OPL550, OPL550-OC Normalized Supply Current vs Ambient Temperature



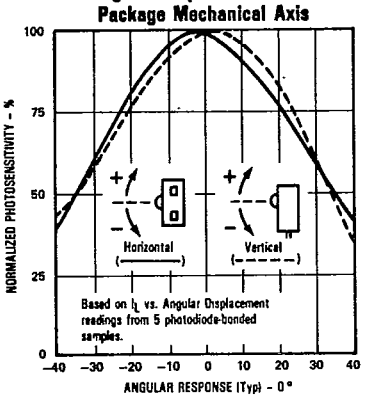
OPL551, OPL551-OC Normalized Supply Current vs Ambient Temperature



Normalized Threshold Irradiance vs Ambient Temperature

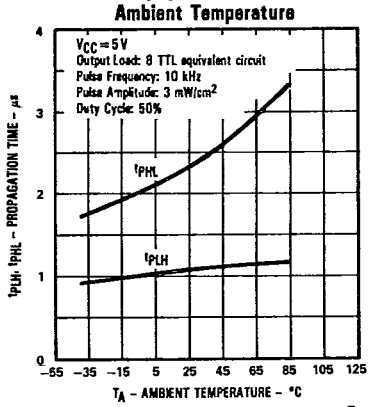


Angular Displacement from Package Mechanical Axis

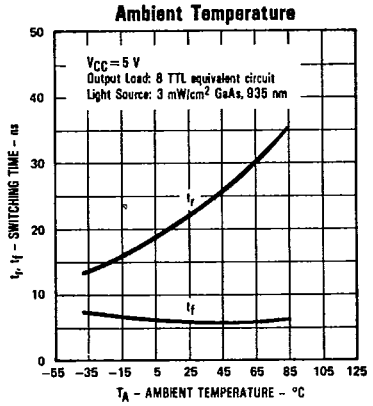


D

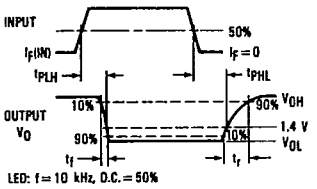
Propagation Time vs Ambient Temperature



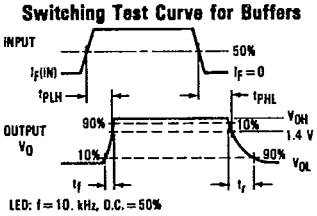
Rise Time and Fall time vs Ambient Temperature



Switching Test Curve for Inverters



Switching Test Curve for Buffers



Optoelectronics Division, TRW Electronic Components Group, 1215 W. Crosby Rd., Carrollton, TX 75006 (214) 323-2200, TLX 6716032 or 215849