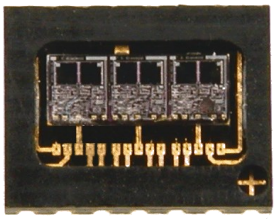
Optical Comparator Array

OPR5011

Features:

- Precise active area location
- Surface mountable
- TTL compatible output
- Wide supply voltage range
- Wide operating temperature range



Description:

Each **OPR5011** device is a hybrid sensor array that consists of three channels of the OPTEK differential optical comparator ('TRI-DOC") IC. The single chip construction ensures very tight dimensional tolerances between active areas.

Specifically designed for high-speed/high-resolution encoder applications, the open collector output switches based on the comparison of the input photodiode's light current levels. Logarithmic amplification of the input signals facilitates operation over a wide range of light levels.

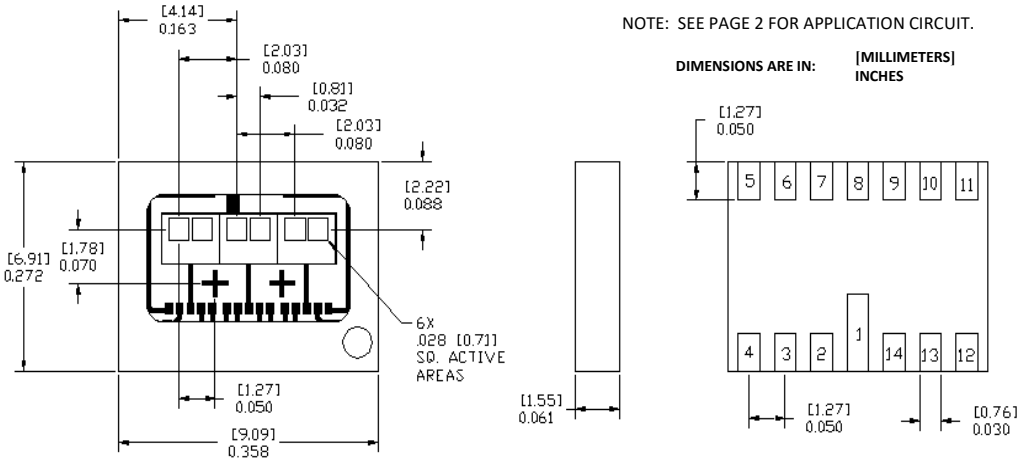
The surface-mountable opaque polyimide package shields the photodiodes from stray light and can withstand multiple exposures to the most demanding soldering conditions, while the gold-plated wraparound contacts provide exceptional storage and wetting characteristics.

See Application Bulletin 237 for handling instructions.

Applications:

- High-speed applications
- High-resolution applications
- Applications requiring a wide range of light levels

Warning: Front Window is pressure sensitive. Do not apply pressure or high vacuum to window.



RoHS

MOISTURE (Level-4)

ESD (Human Body Model)

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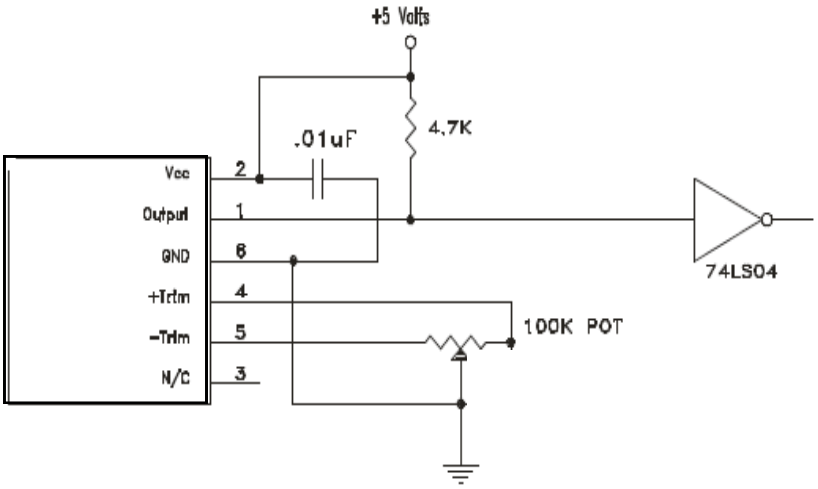
Ordering Information						
Part Number	**Sensor**	**# of Elements**	**Icc (mA) Typ / Max**	**Optical Hysteresis (%) Typical**	**Optical Offset (%) Min / Max**	**Packaging**
OPR5011	Differential Optical Comparator	3	9 / 20	40.00	-40/+40	Chip Tray
OPR5011T	Differential Optical Comparator	3	9 / 20	40.00	-40/+40	Tape & Reel

Application Circuit - OPR5011

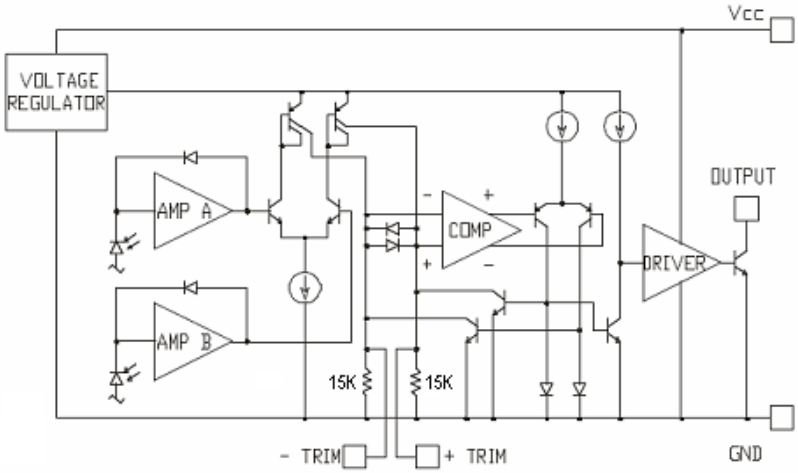


Notes:

(1) The 74LS04 is recommended as a means of isolating the "DOC" comparator circuitry from transients induced by inductive and capacitive loads.

(2) It is recommended that a decoupling capacitor be placed as close as possible to the device.

Block Diagram - OPC8332



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Electrical Specifications

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

Storage and Operating Temperature	-40° C to +100° C
Supply Voltage	24 V
Output Voltage	24 V
Output Current	14 mA
Power Dissipation	500 mW
Solder reflow time within 5°C of peak temperature is 20 to 40 seconds[1]	250° C

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

SYMBOL	PARAMETER	MIN	TYP	MAX	UNITS	TEST CONDITIONS
I_{CC}	Supply Current	-	9	20	mA	V_{CC} = 24 V
V_{OL}	Low Level Output Voltage[2]	-	0.3	0.4	V	I_{OL} = 14 mA, V_{CC} = 4.5 V
I_{OH}	High Level Output Current[3]	-	0.1	1	µA	V_{CC} = V_O = 20 V
OPT-HYS	Optical Hysteresis[4][7]	-	40	-	%	V_{CC} = 5 V, I_{OL} = 1 mA
OPT-OFF	Optical Offset[4][7]	-40	10	+40	%	V_{CC} = 5 V, I_{OL} = 1 mA
f_{max}	Frequency Response[5]	-	1	-	MHz	V_{CC} = 5 V
t_{lh}	Output Rise Time[6]	-	1	-	µs	
t_{hl}	Output Fall Time[6]	-	300	-	ns	

Notes:

(1) Solder time less than 5 seconds at temperature extreme.

(2) Pin (+) = 100.0 nW and Pin (-) = 1.0 µW .

(3) Pin (+) = 1.0 µW and Pin (-) = 100.0 nW.

(4) Pin (-) is held at 1.0 µW while Pin (+) is ramped from 0.5 µW to 1.5 µW and back to 0.5 µW.

(5) Pin (+) is modulated from 1.0 µW to 2.0 µW. Pin (-) is modulated from 1.0 µW to 2.0 µW with phase shifted 180° with respect to Pin (+). Use 100 kΩ trimpot to set the output signal to 50% duty cycle for maximum operating frequency.

(6) Measured between 10% and 90% points.

(7) Optical Hysteresis and Optical Offset are found by placing 1.0 µW of light on the inverting photodiode and ramping the light intensity of the non-inverting input from 0.5 µW up to 1.5 µW and back down. This will produce two trigger points – an upper trigger point and lower trigger point. These points are used to calculate the optical hysteresis and offset.

These are defined as:

$$\% \text{ Optical Hysteresis} = 100 \times \frac{(P_{rise} - P_{fall})}{P_{in(-)}}$$

$$\% \text{ Optical Offset} = \frac{100 \times (P_{average} - P_{(-)})}{P_{in(-)}}$$

Where:

$P_{in(-)}$ = Light level incident upon the "-" photodiode on the IC chip (Pin) (-) = 1.0 µW).

P_{rise} = Value of light power level incident upon the "+" photodiode that his required to switch the digital output when the light level is an increasing level (rising edge).

P_{fall} = Value of light power level incident upon the "+" photodiode that is required to switch the digital output when the light level is decreasing level (falling edge).

$P_{average} = \frac{(P_{rise} + P_{fall})}{2}$