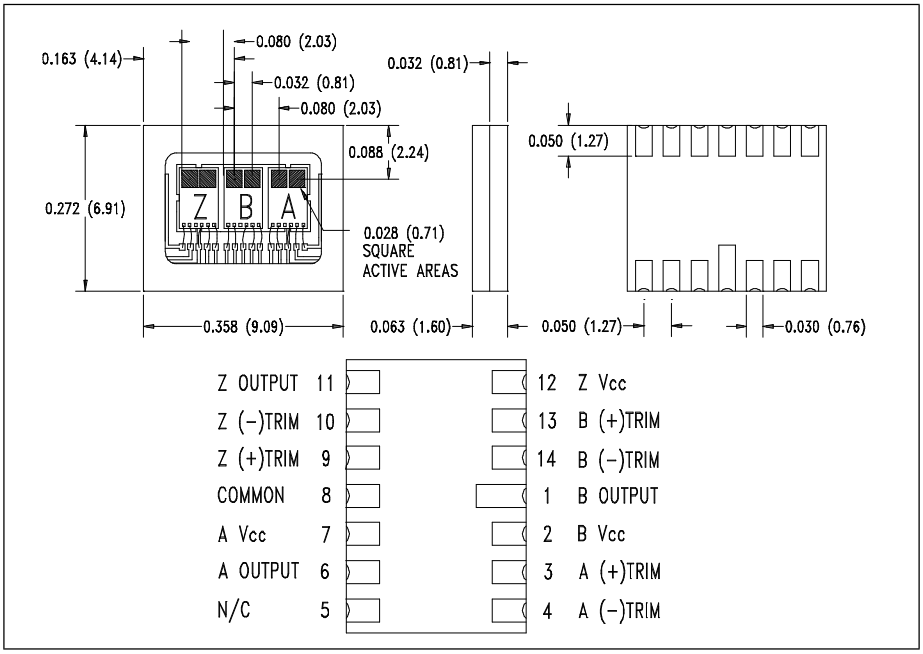
Optical Comparator Array
Type OPR5010



Features

- Surface mountable
- TTL compatible output
- Wide supply voltage range

Description

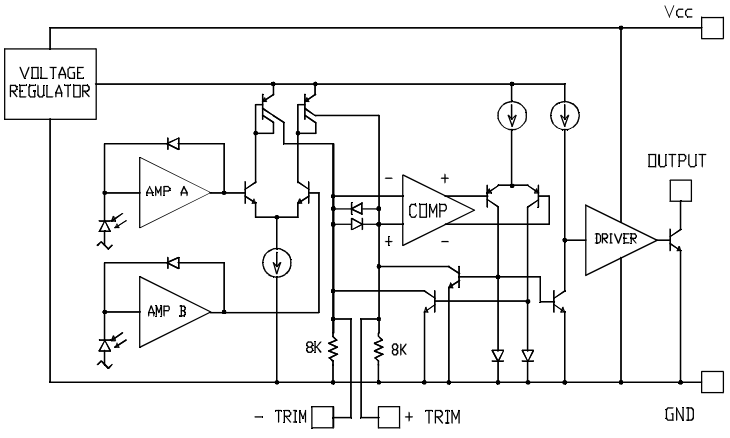
The OPR5010 is a hybrid sensor array consisting of three channels of the Optek OPC8031 Differential Optical Comparator, ("DOC-2") IC. Specifically designed for high speed/high resolution encoder applications, the open collector output switches based on the comparison of input photodiode's light current levels. Logarithmic amplification of the input signals makes possible operation over a wide range of light levels.

The packages are surface mountable and made from a custom opaque polyimide which shields the active devices from stray light. The high temperature laminate can withstand multiple exposures to the most demanding soldering conditions. Wrap around contacts are gold plated for exceptional storage and wetting characteristics.

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

Storage Temperature	-55° C to +125° C
Operating Temperature	-20° C to +80° C
Supply Voltage	24 V
Output Voltage	24 V
Output Current	14 mA
Power Dissipation	500 mW
Soldering Temperature (Vapor Phase Reflow for 30 sec.)	235° C

OPC8031 Block Diagram



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

SYMBOL	PARAMETER	MIN	TYP	MAX	UNITS	TEST CONDITIONS	NOTES
I_{CC}	Supply Current		9	20	mA	V_{CC} = 24 V	
V_{OL}	Low Level Output Voltage		0.3	0.4	V	I_{OL} = 14 mA, V_{CC} = 4.5 V	2
I_{OH}	High Level Output Current		0.1	1.0	µA	V_{CC} = V_O = 20.0 V	3
OPT-HYS	Optical Hysteresis	2.0	15.0	40	%	V_{CC} = 5.0 V, I_{OL} = 1.0 mA	4, 7
OPT-OFF	Optical Offset	-40	10	+40	%	V_{CC} = 5.0 V, I_{OL} = 1.0 mA	4, 7
f_{max}	Frequency Response		1.0		MHz	V_{CC} = 5.0 V	5
t_{lh}	Output Rise Time		1.0		µs		6
t_{hl}	Output Fall Time		300		ns		

Notes:

1. Pin (+) = 1.2 µW and Pin (-) = 0.8 µW.
2. Pin (+) = 100.0 nW and Pin (-) = 1.0 µW.
3. Pin (+) = 1.0 µW and Pin (-) 100.0 nW.
4. Pin (-) 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 (+) modulated from 1.0 µW to 2.0 µW. Pin (-) 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 noninverting input from .5 µW up to 1.5 µW and back down. This will produce two trigger points, an upper trigger point and a lower trigger point. These points are used to calculate the optical hysteresis and offset.

   These are defined as:

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

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

   Where:

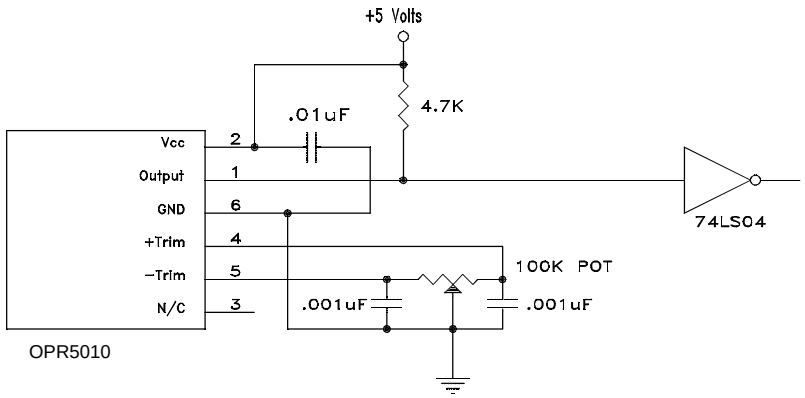
   $P_{in(-)}$ = Light level incident upon the "-" photodiode on the I.C. chip (Pin (-) = 1.0 µW).

   P_{rise} = Value of light power level incident upon the "+" photodiode that is 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 a decreasing level (falling edge).

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

Application Circuit



Notes:

1. A capacitor of a value between .001 to .01 µF connected as close as possible to the trim terminals is recommended *if the device appears to be susceptable to noise transients.* These capacitors *will* reduce f_{max}. It is left to the user to determine the best value for the application.
2. The 74LS04 is recommended as a means of isolating the "DOC" comparator circuitry from transients induced by inductive and capacitive loads.
3. It is recommeded that a decoupling capacitor be placed as close as possible to the device.