

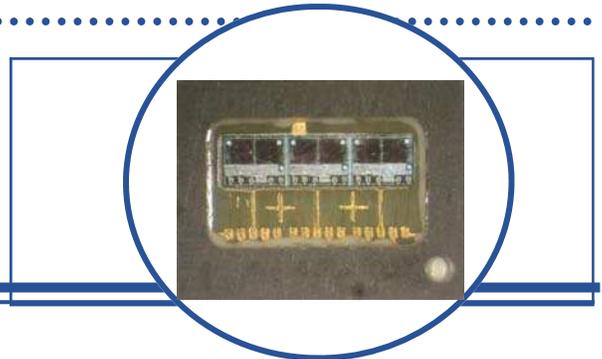
Optical Comparator Array

OPR5011



Features:

- Precise active area location
- Surface mountable
- TTL compatible output
- Wide supply voltage 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.

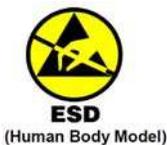
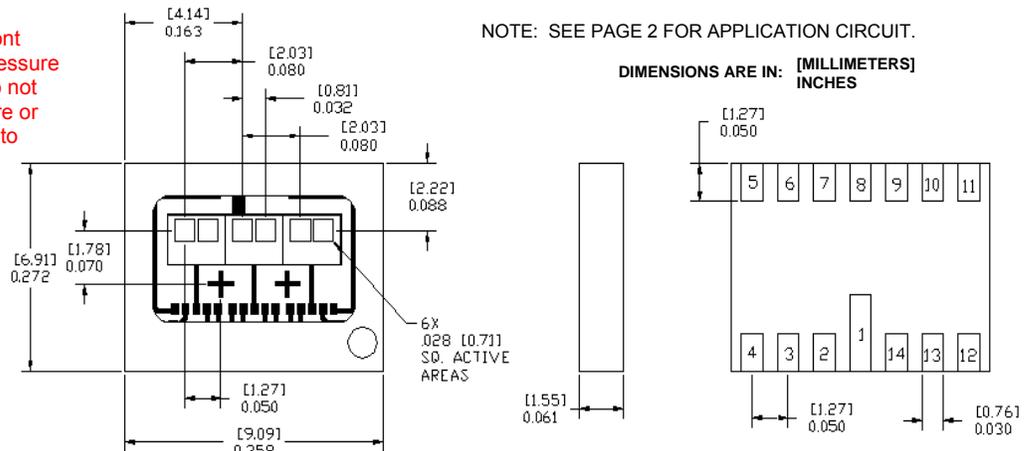
See Application Bulletin 237 for handling instructions.

Applications:

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

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

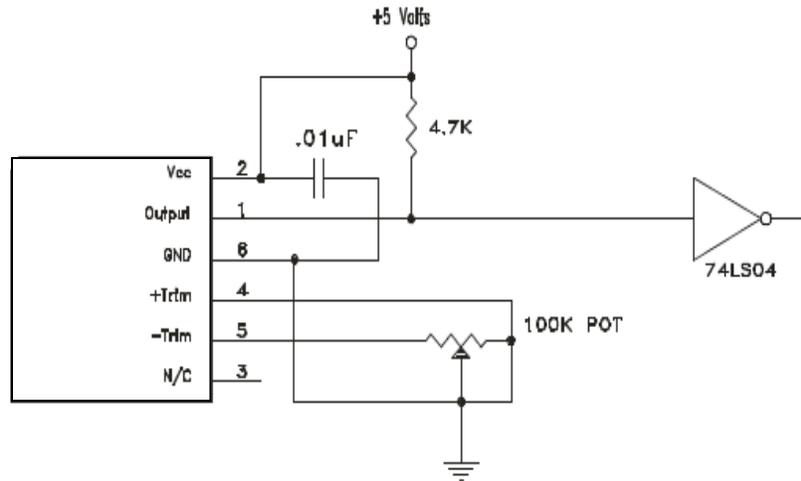
Warning: Front Window is pressure sensitive. Do not apply pressure or high vacuum to window.



Pin #	Description						
1	B - Output	5	N.C.	9	Z + Trim	13	B + Trim
2	B - Vcc	6	A - Output	10	Z -Trim	14	B -Trim
3	A + Trim	7	A - Vcc	11	Z - Output		
4	A -Trim	8	Common	12	Z - Vcc		

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

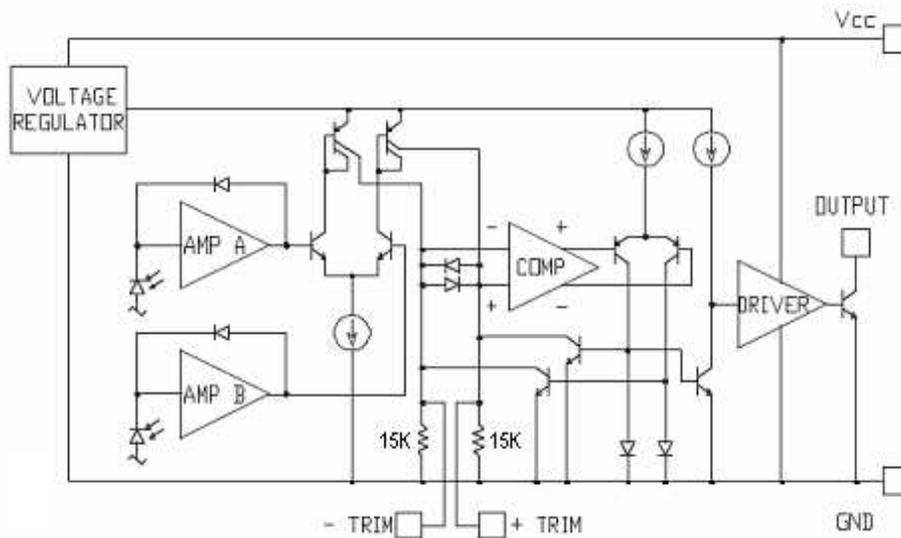
Application Circuit - OPR5011



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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Absolute Maximum Ratings ($T_A = 25^\circ\text{C}$ 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 ($T_A = 25^\circ\text{C}$ unless otherwise noted)

SYMBOL	PARAMETER	MIN	TYP	MAX	UNITS	TEST CONDITIONS
I_{CC}	Supply Current	-	9	20	mA	$V_{CC} = 24\text{ V}$
V_{OL}	Low Level Output Voltage ⁽²⁾	-	0.3	0.4	V	$I_{OL} = 14\text{ mA}$, $V_{CC} = 4.5\text{ V}$
I_{OH}	High Level Output Current ⁽³⁾	-	0.1	1	μA	$V_{CC} = V_O = 20\text{ V}$
OPT-HYS	Optical Hysteresis ⁽⁴⁾⁽⁷⁾	-	40	-	%	$V_{CC} = 5\text{ V}$, $I_{OL} = 1\text{ mA}$
OPT-OFF	Optical Offset ⁽⁴⁾⁽⁷⁾	-40	10	+40	%	$V_{CC} = 5\text{ V}$, $I_{OL} = 1\text{ mA}$
f_{max}	Frequency Response ⁽⁵⁾	-	1	-	MHz	$V_{CC} = 5\text{ V}$
t_{rh}	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 k Ω 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:

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

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

Where:

- $P_{\text{in}}(-)$ = Light level incident upon the “-” photodiode on the IC chip ($P_{\text{in}}(-) = 1.0\ \mu\text{W}$).
- 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 decreasing level (falling edge).
- P_{average} = $\frac{(P_{\text{rise}} + P_{\text{fall}})}{2}$

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