


## APC Amplifier with Integrated Photodiode and Gain Adjust Capability

### FEATURES

- Dual wavelength 650nm and 780nm
- 13 ns Settling Time to 2%
- 100 MHz Bandwidth at -3dB
- 10 mV Output Offset Voltage
- 25  $\mu\text{V}/^\circ\text{C}$  Output Offset Voltage Drift
- $\pm 6$  dB External Gain Adjust
- Small 8-pin OPLGA package
- Power-down mode

Vref	1	 <b>SP8036</b> 8-Pin OPLGA	8	Vcc
Rgain1	2		7	Gain
Rgain2	3		6	Vout
$\overline{\text{CE}}$	4		5	Gnd

### APPLICATIONS

- CD-R, and CD-RW
- DVD+/-R, DVD+/-RW, and DVD-RAM

### GENERAL DESCRIPTION

The SP8036 represents the next generation in Automatic Power Control (APC) amplifiers designed specifically for demanding pick-up head applications. With its integrated photo detector, the SP8036 monitors light intensity of the laser diode in CD-R, CD-RW, DVD+/-R, DVD+/-RW, and DVD-RAM assemblies and converts this light to an output voltage. The magnitude of this voltage signal corresponds to the laser power intensity and is subsequently fed back to the laser diode driver to control the laser output power.

The SP8036 on-chip photo detector transforms incident laser light into a proportional current, which is then converted to a voltage through a transimpedance amplifier. Adjustable gain is provided in the transimpedance amplifier by means of a gain control loop that is controlled by an external resistor. This external resistor is not a part of the signal path, which greatly reduces the effects of all parasitic capacitances and inductances on the flex cable at these pins. The signal is then buffered to provide reactive load drive capability.

The SP8036 achieves an unparalleled level of performance by combining excellent DC stability and low noise with outstanding AC performance. This level of performance is achieved using a proprietary fully complimentary BICMOS process with fully integrated, on-board photo detector.

The SP8036 is offered with a nominal sensitivity 4450 V/W and is packaged in a 3.0 x 3.5 mm, 8-lead OPLGA package. All input logic levels should not be left open at any time.

The SP8036 offers power-down capability with the new active-low chip enable pin,  $\overline{\text{CE}}$ . The chip operates normally when this pin is connected to GND and powers down when connected to Vcc.

## FUNCTIONAL DIAGRAM

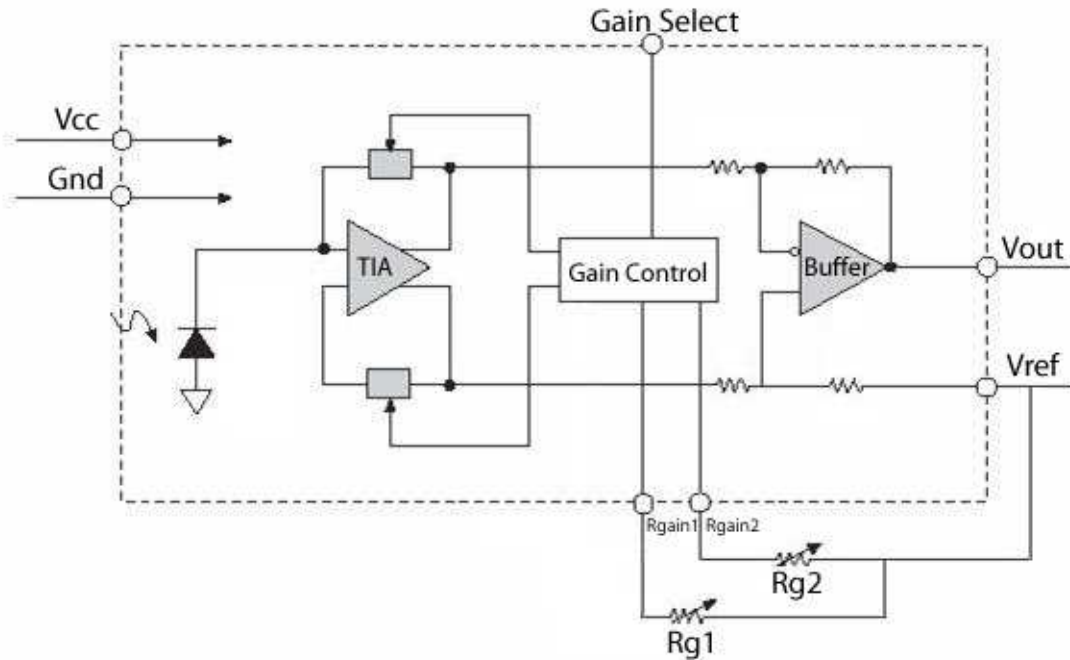


Figure 1: Functional Diagram

## ABSOLUTE MAXIMUM RATINGS

These are stress ratings only and functional operation of the device at these ratings or any other above those indicated in the operation sections of the specifications below is not implied. Exposure to absolute maximum rating conditions for extended periods of time may affect reliability.

Supply Voltage (Vcc).....	6.0V
All Other Pins.....	6.0V
Junction Temperature (T <sub>J</sub> ).....	120°C
Storage Temperature.....	-40°C to +100°C
Soldering Temperature.....	+235°C

## RECOMMENDED OPERATING CONDITIONS

Supply Voltage (Vcc).....	4.5V to 5.5V
Reference Voltage (V <sub>REF</sub> ) .....	1.9V to 2.3V
Operating temperature.....	-20 to +85°C

## THERMAL SPECIFICATIONS

8-pin OPLGA (3 x 3.5mm) Package Thermal Resistance.....90°C/W

## ELECTRICAL/OPTICAL SPECIFICATIONS

Unless otherwise noted:  $4.5V \leq V_{CC} \leq 5.5V$ ,  $V_{REF} = 2.1V$ , output load:  $R_L = 1k\Omega$  to  $V_{REF}$ ,  $C_L = 20pF$  to GND,  $R_{GAIN} = 400ohm$ , ambient temperature  $-20^\circ C \leq T_A \leq +85^\circ C$

Parameter	Conditions	Min	Typ	Max	Units	
Supply Voltage		4.5	5	5.5	V	
Supply Current	$T_A = 25^\circ C$ , no signal		13	18	mA	
	$-20 \leq T_A \leq +85^\circ C$ , no signal			25		
Voltage Reference Range	$R_{GAIN} = 400ohm$	1.9	2.1	2.3	V	
Output Offset Voltage	Referenced to $V_{REF}$	-10		10	mV	
Output Offset Voltage Drift	$R_{GAIN} = 400ohm$	-25		25	$\mu V/^\circ C$	
	$R_{GAIN} = 950ohm$	-50		50		
Power Supply Rejection Ratio (PSRR) *	$R_{GAIN} = 400ohm$ , $4.5V \leq V_{CC} \leq 5.5V$	55	73		dB	
	$R_{GAIN} = 950ohm$ , $4.5V \leq V_{CC} \leq 5.5V$	50	75			
Gain Switch Logic Levels	Logic level low			0.8	V	
	Logic level high	2.4				
Output Sensitivity	Any Select Mode. Laser Beam Diameter = 0.70mm, uniform density ( $R_{GAIN} = 400ohm$ )		4450		V/W	
Input Optical Power required to produce a 1.5V output swing	Any Select Mode $R_{GAIN} = 400ohm$		0.34		mW	
Photo Detector Active Area			0.25		mm <sup>2</sup>	
Output Sensitivity Change vs. $V_{CC}$	$R_{GAIN} = 950ohm$			5	%/V	
Output Sensitivity Change vs. Temperature	$R_{GAIN} = 950ohm$			0.1	%/ $^\circ C$	
Output Noise (+6 dB)	$1kHz \leq BW \leq 1MHz$		0.14	2	mV	
	$1kHz \leq BW \leq 100MHz$		1.28	5		
Output Slew Rate			190		V/ $\mu s$	
Output Settling Time to 2% of finale value (1.5V step)	-6dB		12.6	15	ns	
	0dB		13.1	15		
	+6dB		14.0	15		
Full Scale Output Voltage Swing	Referenced to $V_{REF}$	-1.5	-1.7		Vp-p	
Output Overshoot	$V_{OUT} = 1.5V$ step			5	%	
Bandwidth (-3dB)	$R_{GAIN} = 400ohm$	70	100		MHz	
Gain Adjust Range at	$V_{CC} = 5.0V$	$150ohm \leq R_{GAIN} \leq 950ohm$	-6		+6	dB
	$V_{CC} = 4.5V$	$250ohm \leq R_{GAIN} \leq 950ohm$	-3		+6	

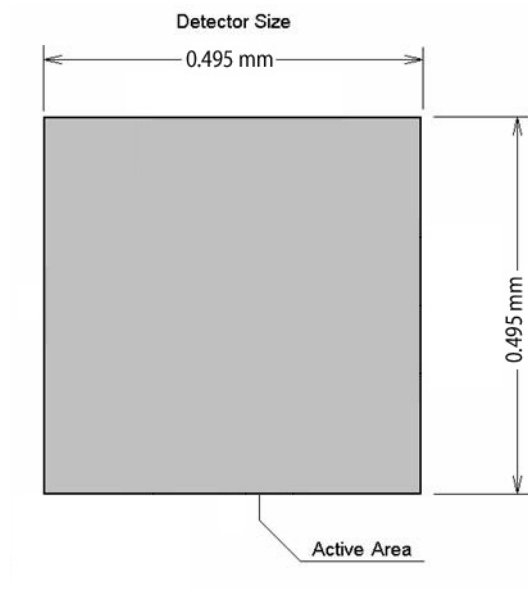
\* PSRR =  $20 \log(\Delta V_{CC} / \Delta V_{OUT})$ , where  $V_{OUT}$  is the output voltage without signal (offset voltage)

## PIN ASSIGNMENTS

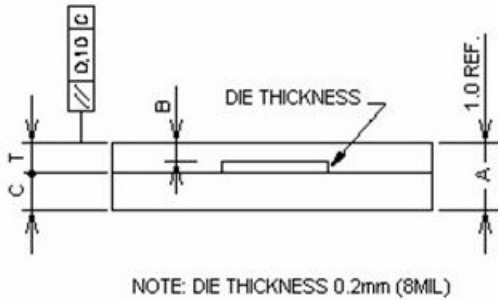
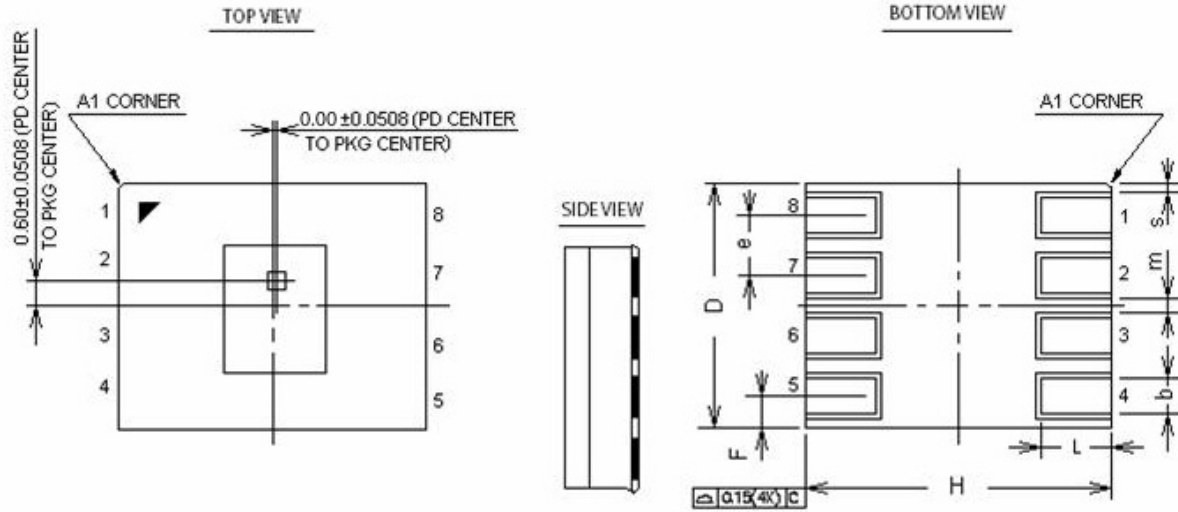
Pin #	Pin Name	Pin Function
1	Vref	Reference Voltage
2	Rgain1	Gain Adjust Resistor $R_{GAIN1}$ connection point
3	Rgain2	Gain Adjust Resistor $R_{GAIN2}$ connection point
4	CE	Active low Chip enable
5	GND	Power Ground
6	Vout	Output Voltage
7	Gain	Gain Switch Input. Low level or Open selects pin $R_{GAIN1}$ , high level selects pin $R_{GAIN2}$
8	Vcc	Supply Voltage. Bypass to GND with ceramic capacitor 0.1 $\mu F$

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## PHOTO DETECTOR PATTERN



# OPLGA 8-pin PACKAGE DIMENSIONS



08L 3.5 X 3.0 MM OPLGA			
SYMBOLS	DIMENSIONS IN MILLIMETERS		
	MIN	NOM	MAX
A	0.90	1.00	1.10
B	0.19	—	0.25
b	0.30	0.40	0.50
C	—	0.56	—
H	3.40	3.50	3.60
D	2.90	3.00	3.10
e	—	0.75	—
L	0.50	0.60	0.70
T	—	0.45	—
F	0.28	0.38	0.48
s	0.075	—	—
m	0.10	—	—
SIPEX Pkg Sign-off Date/Rev.: JL 04/12/06 Rev. A			

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**ORDERING INFORMATION**

<b>Part number</b>	<b>Temperature range</b>	<b>Package Type</b>
SP8036DG4	-20 + 85 <sup>0</sup> C	8-pin OPLGA

**Sipex Corporation**

**Headquarters and  
Sales Office**  
233 South Hillview Drive  
Milpitas, CA 95035  
TEL: (408) 934-7500  
FAX: (408) 935-7600

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