Solved by
Sipex™

SP8036

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 $\mu V/^{\circ}C$ Output Offset Voltage Drift
- ± 6 dB External Gain Adjust
- Small 8-pin OPLGA package
- Power-down mode

Vref	1	Sipex	8	Vcc
Rgain1	2	SP8036	7	Gain
Rgain2	3	8-Pin	6	Vout
$\overline{CE}$	4	OPLGA	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, $\overline{CE}$. The chip operates normally when this pin is connected to GND and powers down when connected to Vcc.
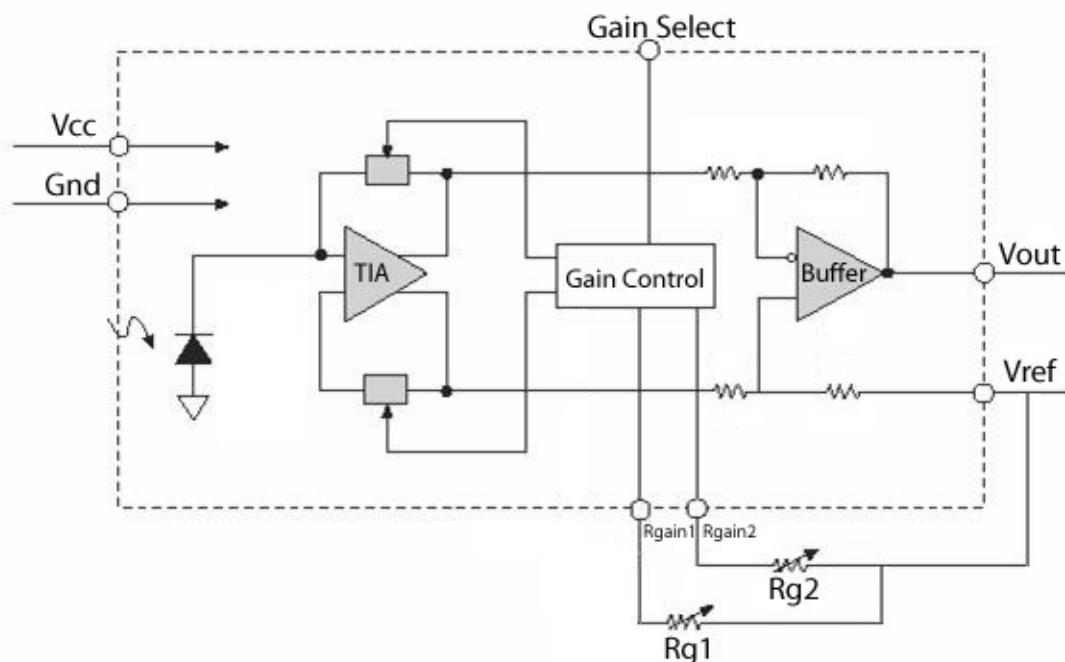
Figure 1: Functional Diagram

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_J)………..…………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$_{REF}$) ....……………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 ≤ Vcc ≤ 5.5V, V_{REF} =2.1V, output load: R_L = 1kΩ to V_{REF}, C_L = 20pF to GND, R_{GAIN} = 400ohm, ambient temperature -20 ^{o}C ≤T_A ≤ +85°C

Parameter	Conditions	Min	Typ	Max	Units
Supply Voltage		4.5	5	5.5	V
Supply Current	T_A = 25 ^{o}C, no signal		13	18	mA
	-20 ≤T_A ≤ +85 ^{o}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	µV/^{o}C
	R_{GAIN} = 950ohm	-50		50	
Power Supply Rejection Ratio (PSRR) *	R_{GAIN} = 400ohm, 4.5V ≤ Vcc ≤ 5.5V	55	73		dB
	R_{GAIN} = 950ohm, 4.5V ≤ Vcc ≤ 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^2
Output Sensitivity Change vs. Vcc	R_{GAIN} = 950ohm			5	%/V
Output Sensitivity Change vs. Temperature	R_{GAIN} = 950ohm			0.1	%/^{o}C
Output Noise (+6 dB)	1kHz ≤ BW ≤ 1MHz		0.14	2	mV
	1kHz ≤ BW ≤ 100MHz		1.28	5	
Output Slew Rate			190		V/µs
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	Vcc = 5.0V	150ohm≤R_{GAIN}≤950ohm	-6		+6	dB
	Vcc = 4.5V	250ohm≤R_{GAIN}≤950ohm	-3		+6	

* PSRR = 20log (ΔVcc/ΔV$_{OUT}$), 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	$\overline{CE}$	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 0.1µF

Detector Size

0.495 mm

0.495 mm

Active Area

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			

NOTE: DIE THICKNESS 0.2mm (8MIL)
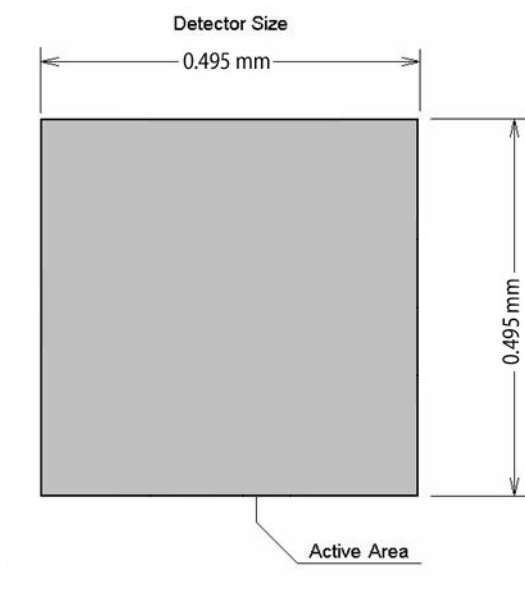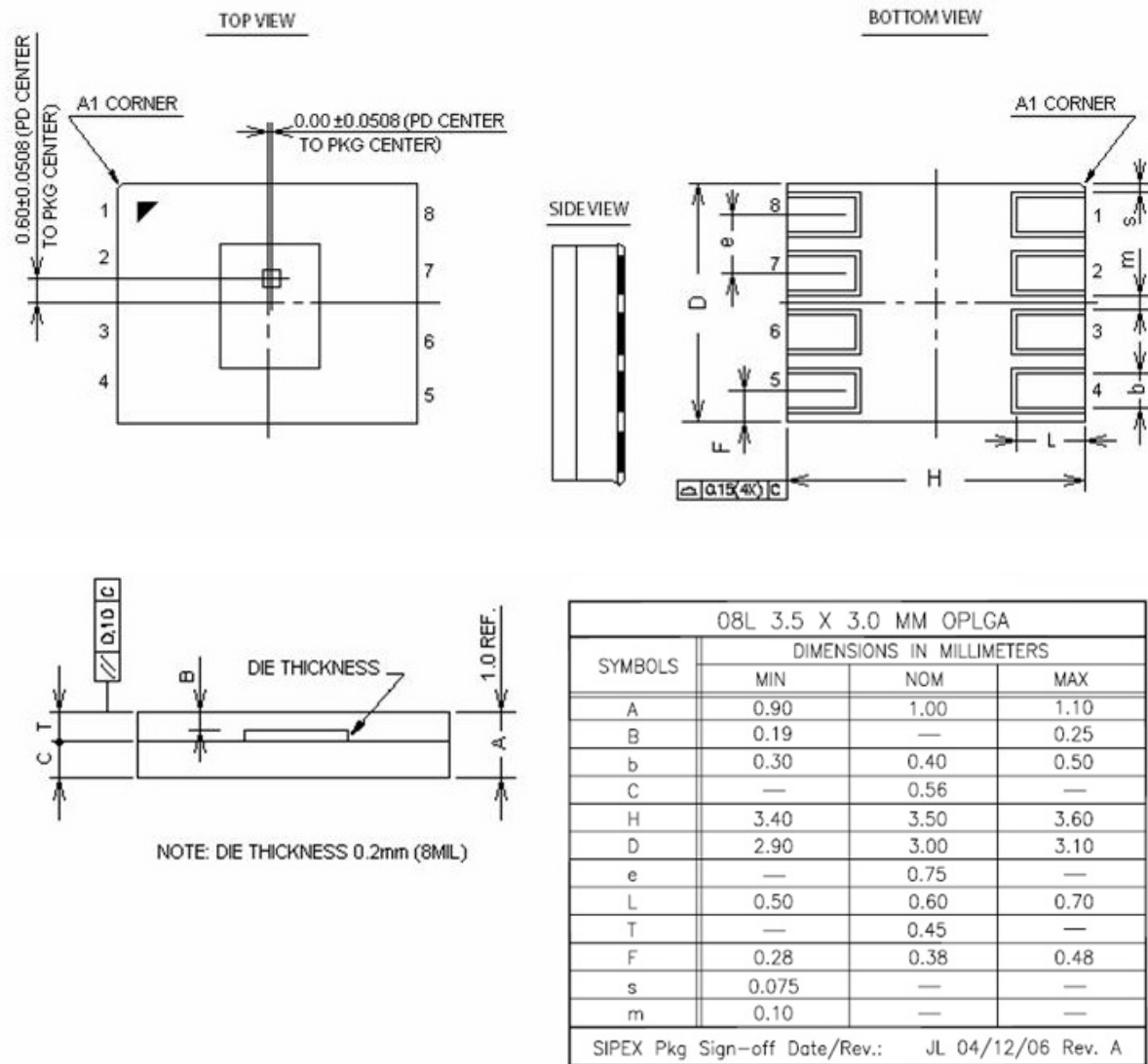
ORDERING INFORMATION

Part number	Temperature range	Package Type
SP8036DG4	-20 + 85^{0}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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