




## Three Channel High Performance Laser Driver

### FEATURES

- Three current controlled inputs with independent ENABLE/DISABLE
- Two selectable outputs for grounded laser diodes
- Output current up to 400mA (250mA per input channel)
- Independent swing for each output channel controlled by external resistor
- On-chip oscillator with resistor controlled frequency
- Single 5V power supply
- Common ENABLE and oscillator ENABLE inputs
- TTL/CMOS logic level control signals
- Small QSOP16 package

### APPLICATION

- DVD-RAM with CD-RW capability
- DVD-RW with CD-RW capability
- Writable data storage optical devices

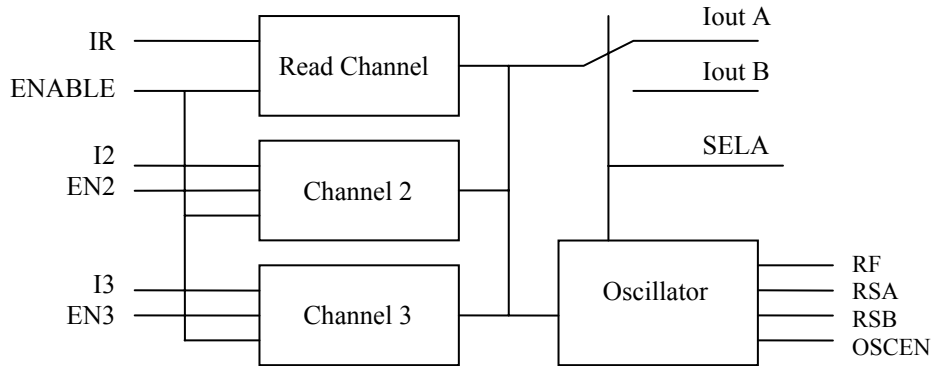
IR	1	 SP8107 QSOP-16	16	Vcc
I2	2		15	Iout A
I3	3		14	GND
RF	4		13	RSA
EN2	5		12	RSB
EN3	6		11	Iout B
ENABLE	7		10	SELA
OSCEN	8		9	Vcc

### GENERAL DESCRIPTION

The SP8107 is a three channel laser diode driver specifically designed for high speed DVD-RW or DVD-RAM applications. It operates two grounded laser diodes (650nm for DVD and 780nm for CD) and features three input channels that allow setting of three different optical power levels. The first channel (IR) has lower gain (100mA/mA) and output current (up to 200mA) and is used as a read channel. The second (I2) and third (I3) channels have higher gain (250mA/mA) and output current (up to 250mA) and are used as write channels. Each write channel may be switched on/off at very fast switching speeds with TTL/CMOS logic level signals applied to EN2 and EN3 inputs - channels are enabled at low logic level and disabled at high logic level. Outputs of all channels are summed together and connected to one of the outputs I<sub>OUT A</sub> or I<sub>OUT B</sub> depending on logic signal at the input SELA. High logic level at SELA selects output I<sub>OUT A</sub>, while low logic level selects output I<sub>OUT B</sub>. Inputs IR, I2, and I3 are current-controlled with 200 ohm DC impedance but allow voltage control by using external limiting resistors.

An on-chip oscillator is used to reduce laser mode hopping in read mode. The frequency of this oscillator may be changed by an external resistor connected to the RF pin. Oscillator swing can be set separately for I<sub>OUT A</sub> and I<sub>OUT B</sub> outputs by two resistors connected to RSA and RSB pins respectively. The oscillator is enabled by high logic level at the OSCEN pin.

Low logic level at the ENABLE pin disables the entire device. Supply current in disabled mode is below 100uA. Pins EN2 and EN3 have internal pull-up resistors. Pins ENABLE, OSCEN, and SELA have internal pull-down resistors.



SP8107 Schematic 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.

Input voltage at any input....-0.6V to Vcc +0.5V  
 Power Dissipation (Pmax).....0.7 to 1W\*  
 Output voltage (Vout).....-0.5 to Vcc - 1  
 Storage Temperature.....-65°C to +125°C  
 Junction Temperature.....+150°C

\*) 0.7W at Tamb=70°C and 1W at Tamb=25°C

Supply Voltage (Vcc).....-0.5V to 6.0V

### RECOMMENDED OPERATING CONDITIONS

Supply Voltage (Vcc).....4.5V to 5.5V  
 Input current (IR, I2, I3).....<2.0mA  
 External resistor to GND to set  
 Oscillator frequency (RF).....>3 kΩ

External resistor to GND to set  
 Oscillator swing (RSA, RSB).....>1 kΩ  
 Operating Temperature Range.....-40°C to 85°C



## ELECTRICAL SPECIFICATIONS

Unless otherwise noted Tamb=25°C. All logic inputs are TTL/CMOS compatible.

Parameters	Test Conditions	Unit	Min.	Typ.	Max.
Supply current, power down	ENABLE=0V, EN2=EN3=0V	mA		0.6	1.0
Supply current, read mode, oscillator disabled	IR=500uA, EN2=EN3=5V OSCEN=0V	mA		80	100
Supply current, read mode, oscillator enabled, output A selected	IR=500uA, EN2=EN3=5V OSCEN=5V, RSA=8.2k RF=6.8k	mA		93	105
Supply current, write mode	IR=500uA, I2=I3=200uA	mA		180	225
Supply current, input off	IR=I2=I3=0uA EN2=EN3=0V	mA		14	22
Vcc shutdown voltage		V		2.4	
EN2/EN3 low voltage		V			0.8
EN2/EN3 high voltage		V	2.4		
SELA low voltage		V			0.8
SELA high voltage		V	2.4		
ENABLE low voltage		V			0.8
ENABLE high voltage		V	2.7		
OSCEN low voltage		V			0.8
OSCEN high voltage		V	2.4		
EN2/EN3 low current	EN=0V	uA	-200		
EN2/EN3 high current	EN=5V	uA			200
SELA low current	SELA=0V	uA	-50		
SELA high current	SELA=5V	uA			150
ENABLE low current	ENABLE=0V	uA	-100		
ENABLE high current	ENABLE=5V	uA			100
OSCEN low current	OSCEN=0V	uA	-100		
OSCEN high current	OSCEN=5V	uA			200
Total output current	Output is sourcing	mA	400		
Output current each write channel	Output is sourcing	mA	250		
Best fit current gain read channel	I <sub>IN</sub> =200, 400, 600 uA (1)			100	
Best fit current gain write channel	I <sub>IN</sub> =80, 160, 240 uA (1)			250	
Output current linearity Read channel Write channel 2 Write channel 3	I <sub>IN</sub> =200, 400, 600 uA (1) I <sub>IN</sub> =80, 160, 240 uA (1) I <sub>IN</sub> =80, 160, 240 uA (1)	%	-3		3
Input current range	Input is sinking	uA	0		2000
Output current read channel	Output is sourcing	mA	150		
IR, I2, I3 input impedance	Rin is to GND	ohm	100	200	300
Output current off, mode 1	ENABLE=0V	mA			1
Output current off, mode 2	ENABLE=5V, EN2=EN3=5V IR=0uA, I2=I3=200uA	mA			1
Output current off, mode 3	ENABLE=5V, EN2=EN3=0V IR=I2=I3=0uA	mA			5
I <sub>OUT</sub> sensitivity to Vcc, read mode	I <sub>OUT</sub> =40mA read mode Vcc=5V±10%	%/V	-4		4
I <sub>OUT</sub> sensitivity to Vcc, write mode	I <sub>OUT</sub> =80mA, 40mA read + 40mA write	%/V	-4		4



# Advanced

# SP8107

Parameters	Test Conditions	Unit	Min.	Typ.	Max.
	V <sub>CC</sub> =5V±10%				
I <sub>OUT</sub> current output noise	I <sub>OUT</sub> =40mA OSCEN=0V	nA/√Hz		3	
I <sub>OUT</sub> temperature sensitivity, read mode	I <sub>OUT</sub> =40mA read	ppm/°C		100	
I <sub>OUT</sub> temperature sensitivity, write mode	I <sub>OUT</sub> =80mA 40mA read+ 40mA write	ppm/°C		100	
Write rise time	I <sub>OUT</sub> =40mA read + 40mA write (10% - 90%)	ns		1.2	2
Write fall time	I <sub>OUT</sub> =40mA read + 40mA write (10% - 90%)	ns		1.2	2
Output current overshoot	I <sub>OUT</sub> =40mA read + 40mA write (10% - 90%)	%		5	
I <sub>OUT</sub> ON propagation delay	EN 50% H-L to I <sub>OUT</sub> @ 50% of final value	ns		3	
I <sub>OUT</sub> OFF propagation delay	EN 50% L-H to I <sub>OUT</sub> @ 50% of final value	ns		2	
Disable time	ENABLE 50% H-L to I <sub>OUT</sub> @ 50% of final value	ns		5	
Enable time	ENABLE 50% L-H to I <sub>OUT</sub> @ 50% of final value	ns		30	
SELA OFF delay	SELA 50% H-L to I <sub>OUT</sub> @ 50% of final value	ns		2	
SELA ON delay	SELA 50% L-H to I <sub>OUT</sub> @ 50% of final value	ns		5	
Amplifier bandwidth each channel	I <sub>OUT</sub> =50mA, -3dB value	MHz		20	
Oscillator frequency	RF=7.5kΩ	MHz	255	300	350
Oscillator temperature coefficient	RF=7.5kΩ	ppm/°C		150	
Oscillator disable time	OSCEN 50% H-L to I <sub>OUT</sub> @ 50% of final value	ns		4	
Oscillator enable time	OSCEN 50% L-H to I <sub>OUT</sub> @ 50% of final value	ns		1.5	

**Note (1):** Linearity of the amplifier is calculated using best fit method at three operating points of I<sub>OUT</sub> = 20mA, 40mA, and 60mA. I<sub>OUT</sub> = (I<sub>IN</sub> X GAIN)

## THERMAL SPECIFICATIONS

Thermal resistance junction-ambient  $\Theta_{JA}$ .....115C/W

## PIN ASSIGNMENTS

Pin Number	Pin Name	Pin Function
1	IR	Read Channel current controlled input
2	I2	Write Channel 2 current controlled input
3	I3	Write Channel 3 current controlled input
4	RF	Connection of an external resistor to GND to set oscillator frequency
5	EN2	Write Channel 2 enable input with an internal pull-up resistor. Logic high or floating turns channel off.
6	EN3	Write Channel 3 enable input with an internal pull-up resistor. Logic high or floating turns channel off.
7	ENABLE	Common device enable input with pull-down resistor. Logic low or floating turns device off.
8	OSCEN	Oscillator enable input with pull-down resistor. Logic low or floating turns oscillator off.
9	Vcc	Supply voltage. Bypass to GND with 0.1uF ceramic capacitor
10	SELA	Output select input with pull-down resistor. Logic high selects output A, low or floating selects output B
11	I <sub>OUT B</sub>	Output current source B for a laser diode
12	RSB	Connection of an external resistor to GND to set oscillator swing at the output B
13	RSA	Connection of an external resistor to GND to set oscillator swing at the output A
14	GND	Ground pin
15	I <sub>OUT A</sub>	Output current source A for a laser diode
16	Vcc	Supply voltage. Bypass to GND with ceramic capacitors 0.1 and 0.01uF in parallel

## BOARD LAYOUT AND GROUNDING

To obtain the best performance from the SP8107, a printed circuit board with ground plane is required. Layout should ensure that analog signal lines (IR, I2, and I3) are separated as much as possible from digital and output power lines. Output power lines should be as short and wide as possible. High quality, low series resistance ceramic 0.1 and 0.01uF bypass capacitors should be used at the Vcc pins 9 and 16. These capacitors must be located as close to the pins as possible. The traces connecting the pins and the bypassing capacitors must be kept short and should be made as wide as possible.



## ORDERING INFORMATION

Part number	Temperature range	Package Type
SP8107EH	-40 to +85 <sup>0</sup> C	16-pin QSOP