

IR3C07/IR3C07N Laser Diode Driver IC

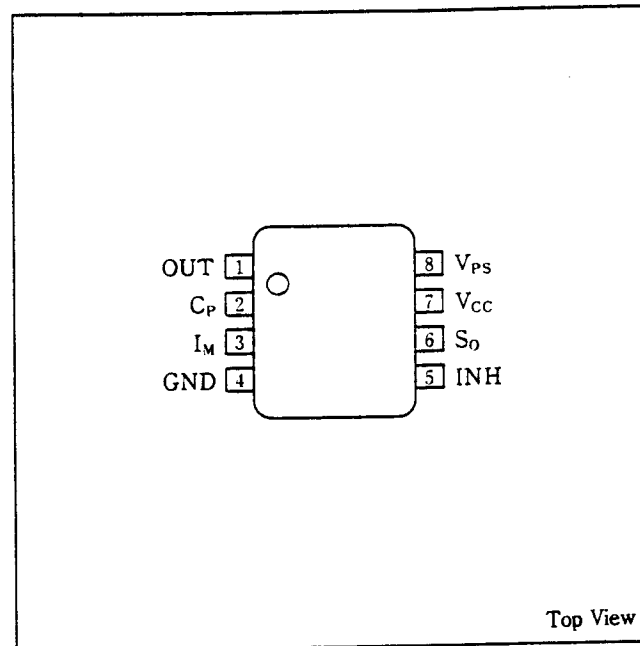
■ Description

The IR3C07/IR3C07N is a monolithic driver IC capable of DC drive automatic power control of laser diodes or light emitting diodes with its photo detector for monitoring, and is designed to operate from a single power supply voltage.

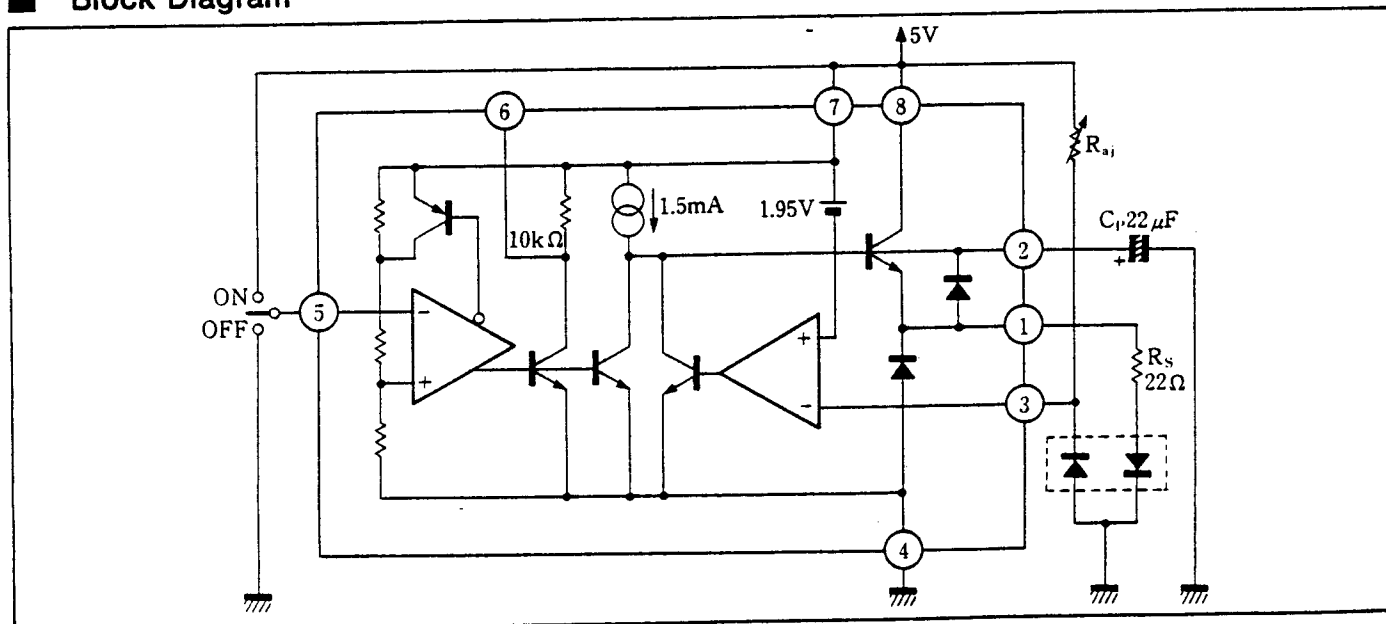
■ Features

1. Single power supply: 4.5V~5.5V
2. The externally connected thermistor allows the ambient temperature to be detected and driving to be stopped (Thermal shut-off function)
3. With inhibit input terminal (ON-OFF)(To be driven at standard CMOS. TTL level)
4. Diode driving terminal separated from control circuit terminal
5. Adjustable light output
6. 8-pin dual-in-line package (IR3C07)
8-pin small outline package, (IR3C07N)

■ Pin Connections



■ Block Diagram



Absolute Maximum Ratings

(Ta=25°C)

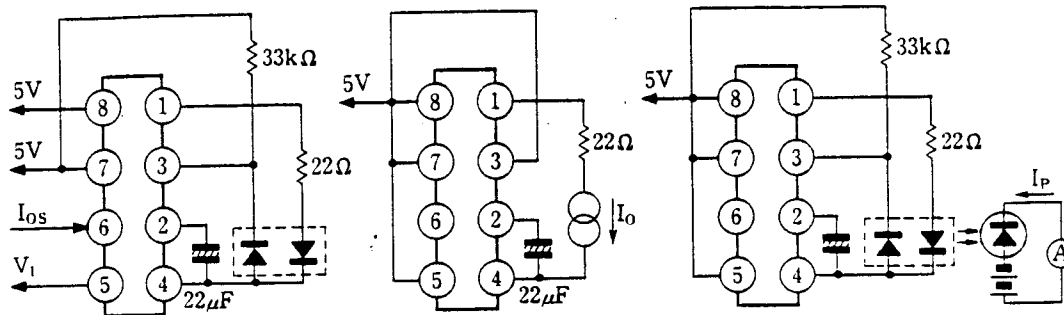
Parameter	Symbol	Conditions	Rating	Unit	
Supply Voltage	V _{CC}	Pin 7	10	V	
Supply Voltage	V _{PS}	Pin 8	10	V	
Output Current	I _O	Pin 1	-170	mA	
Output Current	I _{OS}	Pin 6 (ON time)	5	mA	
Output applied voltage	V _{OS}	Pin 6 (OFF time)	-0.2~V _{CC}	V	
Inhibit input voltage	V _I	Pin 5	-0.2~V _{CC}	V	
Monitor input voltage	V _{IM}	Pin 3	-0.2~V _{CC}	V	
Power dissipation	P _D	Ta ≤ 25°C	IR3C07	800	mW
			IR3C07N	500	
P _D derating ratio	ΔP _D /°C	Ta > 25°C	IR3C07	7.0	mW/°C
			IR3C07N	4.4	
Operating temperature	T _{opr}		-30~+85	°C	
Storage temperature	T _{stg}		-55~+150	°C	

Electrical Characteristics

(V_{CC}=5V, V_{PS}=5V, Ta=25°C)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit	Test Circuit	
Operating supply voltage	V _{CC}		4.5	5.0	5.5	V		
Circuit current	I _{CC ON}	V _I =5V		3.8	6.8	mA	Pin7 Fig. 1	
	I _{CC OFF}	V _I =0V		5.0	9.0			
Output voltage	V _{O1}	I _O =-150mA	3.7	4.1		V	Pin1 Fig. 2	
	V _{O2}	I _O =-100mA	3.8	4.2				
	V _{O3}	I _O =-20mA	3.9	4.3				
Output voltage	V _{OS1}	I _{OS} =0mA		0.05		V	Pin6 Fig. 1	
	V _{OS2}	I _{OS} =2mA		0.1	0.4			
Inhibit input voltage	H	V _{IH}	V _O , V _{OS} : L→H	1.43	1.53	1.63	V	Pin5 Fig. 1
	L	V _{IL}	V _O , V _{OS} : H→L	1.23	1.33	1.43		
	Hysteresis	V _{IHY}	V _{IH} -V _{IL}		200			
Inhibit input current	I _I			-0.3	-5	μA	Pin5 Fig. 1	
Monitor input terminal voltage	V _M	in equilibrium operation	1.71	1.95	2.19	V	Between Pin 3 & 7 Fig. 1	
Monitor input terminal current	I _M			-0.3	-5	μA	Pin3 Fig. 1	
Light output power supply fluctuation	ΔI _P / I _P ΔV _{CC}	V _{CC} =4.5~5.5V		0.2		%/V	Fig. 3	
Light output fluctuation range	ΔI _P /I _P	Ta = -20~+85°C		0.2		%	Fig. 3	

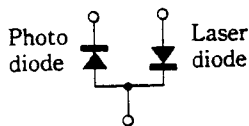
Test Circuit



(Temperature chamber is only used for the IR3C07 to measure the light output temperature change.)

Precautions

(1) The internal connection of the laser diode used for this driver is as follows.



(2) On operating the automatic power control, the condition $V_{PS} - V_{CC} \geq -0.3V$ is necessary to be satisfied.

(3) The Inhibit input pin 5 and Monitor input pin 3 are base pins of PNP emitter follower. The pins in open state places the device in "High" input mode. Do not open the pin 3 when in APC operation.

(4) The IR3C07/IR3C07N has a voltage control output on pin 1. The output pin 1 external resistor R_S should be greater than 5Ω and the pin 2 external capacitor C_P greater than $2\mu F$. The external capacitor C_P should be used with a good characteristic in high frequency band, such as tantalum, or ceramic capacitors.

(5) Connect capacitor of normally $0.5 \sim 2\mu F$ as required in parallel against the surge from the laser diodes and the noise. An L connected in series with the diode also works effectively.

(6) The voltage at the monitor input pin 3 that is

($V_{CC} - 1.95$) V TYP. in automatic power control operation (ON time) may rise up to V_{CC} in OFF time. Therefore the monitor element with its stand voltage greater than V_{CC} should be used.

(7) The relationship between the light output setting resistor R_{aj} and monitor light output current I_M is as follows.

$$R_{aj} \cong 1.95V/I_M$$

(8) The curves shown next describe the relationship of the laser drive stop temperature (T_{a-s}) and drive return temperature (T_{a-o}) with respect to the external resistor R_1 , for thermal shut-off due to the external thermistor.

(9) When the C_P is used with an electrolytic capacitor, the C_P should be more than $10\mu F$ and a ceramic capacitor should be applied between pins 3 and 7, because low temperature may cause the oscillation for the C_P . However, too much capacitance of the ceramic capacitor will cause an overshoot for drive current of a laser diode when operation starts. Set the rise time constant on pin 2 larger than the fall time constant on pin 3, which is determined by the C_P and the internal constant current of $1.5mA$ (TYP.). Applicable capacitance depends upon light output current of monitor diodes, but it may be $4700pF$ to $47000pF$ approximately.