

DATA SHEET

Switchable Constant Current Laser Diode Driver

General Description

The DN6330 Laser Diode Driver is a programmable voltage controlled constant current source with optical feedback.

The DN6330 is used in applications that require a stable laser diode drive current. This current is set from zero to over 170mA by an input voltage. Constant optical output power can be maintained using feedback from a back facet photodiode. An output voltage is provided that is a measure of the photodiode current and is proportional to the laser diode optical power output. The DN6330 comes in a 10-pin package.

The DN6330 is designed for applications requiring constant current drive for the operation of laser diodes such as pump sources for EDFA's telecom lasers and diode pumped semiconductors.

Features

- Adjustable current to 170mA
- Enable/Disable pin
- For common cathode or isolated laser diode current drive
- Small size
- Feedback control for constant laser power control

Block Diagram

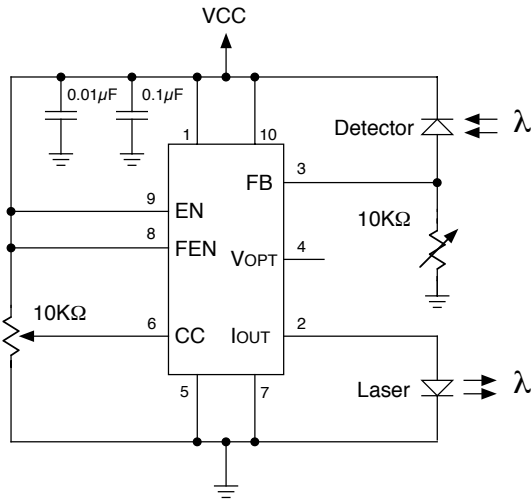


Figure 1

Package Dimensions

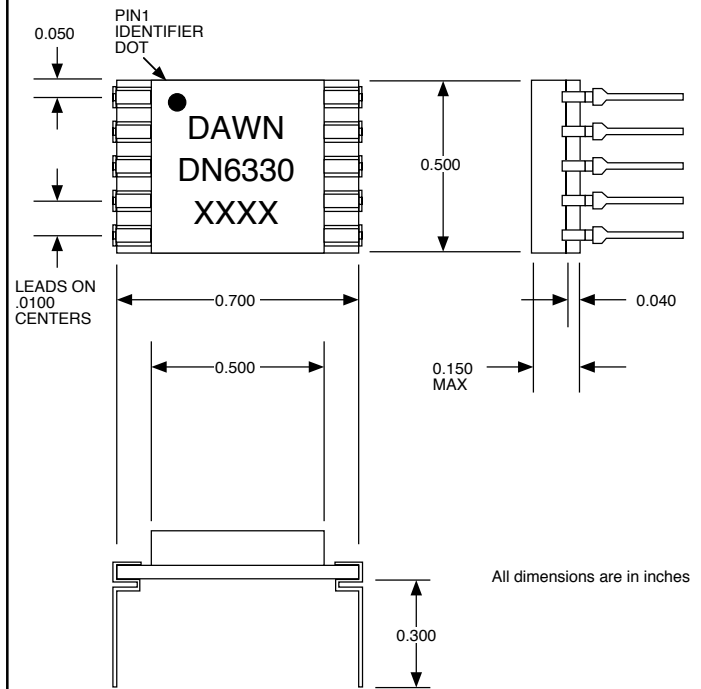


Figure 2

DN6330

Input Specifications

Power Supply Input (Vcc): Pins 1 & 10	+5 to +8Volts @ 250mA Max.
Drive Enable (EN): Pin 9	GND (off, disable), Vcc or open (on, enable)
Current Control (CC): Pin 6	0 to 200mA for input voltage 0 to Vcc
Ground (GND): Pins 5 & 7	Power supply & signal ground
Feedback-Optical(FB): Pin 3	$0 < V_{FB} < V_{cc}$
Feedback-Enable (FEN): Pin 8	Vcc (disable), GND or open (enable)

Output Specifications

Laser Diode Current Drive (I _{OUT}): Pin 2	0 to 170mA @ Vcc = 5V, 0 to 250mA @ Vcc = 8V
Optical Output Monitor (V _{OPT}): Pin 4	Range 0 to 4V

Environmental Specifications

Operating Temperature	-20°C to 100°C (case)
Storage Temperature	-65°C to 150°C (case)

Signal Descriptions

- V_{DD}** Input power supply, +5Volts typical
- EN** The Enable pin is used to enable/disable the output. When the enable pin is connected to ground, the output is disabled. When this pin is connected to Vcc or left open, the laser current is enabled, allowing current to flow through the laser diode.
- CC** The laser diode current is set by the voltage applied to the current control input. The voltage, on the current control input, programs the laser diode drive current, I_{OUT}. When the input is at GND the modulation current is zero. Maximum laser current occurs when this voltage is V_{DD}.
- GND** Ground return for V_{DD} (input power supply).
- FB** This input is used with a photodetector to control output current. The input impedance is 20KΩ to ground.
- FEN** At V_{DD} this input disables Feedback on Pin 3, which allows diode current to be set by the voltage at Pin 6.
- I_{OUT}** This Output provides drive current to the laser diode (anode is positive and the cathode is at ground). Maximum drive current is dependent upon laser diode impedance and the power supply input voltage.
- V_{OPT}** The optical monitor voltage is proportional to the optical output power of the laser diode as sensed by the backfacet photodetector over the range of 1μA to 1mA.

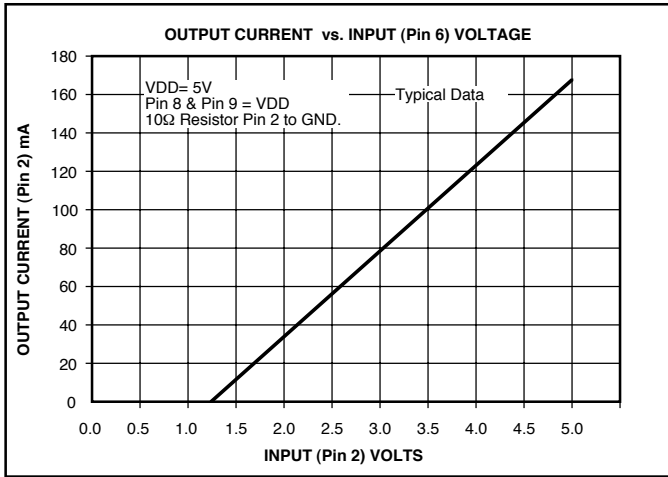
The equation relating the output current I_L (Pin 2 to GND.) of the DN6330 to the input the input voltage V₆ (Pin 6) is shown below. Where V_{DD} is the power supply voltage.

Equation 1 $I_L = 0.045 \cdot V_6 - 0.011 \cdot V_{DD}$ (Amps) $\pm 10\%$

EN Pin 9 = V_{DD}
FEN Pin 8 = V_{DD}
This Disables the Feedback Voltage **FB** (PIN 3)

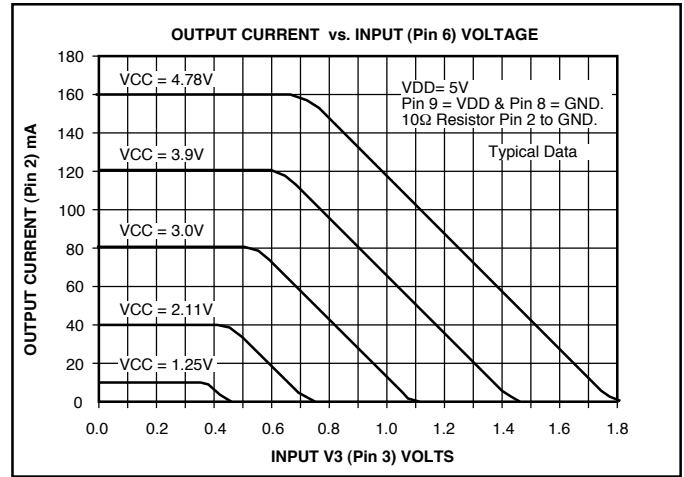
Example: Let V_{DD} = 8.000 Volts and V₆ = 5.300 Volts. Then I_L = 0.150 Amps $\pm 10\%$. See Graph 5.

Constant Current Mode



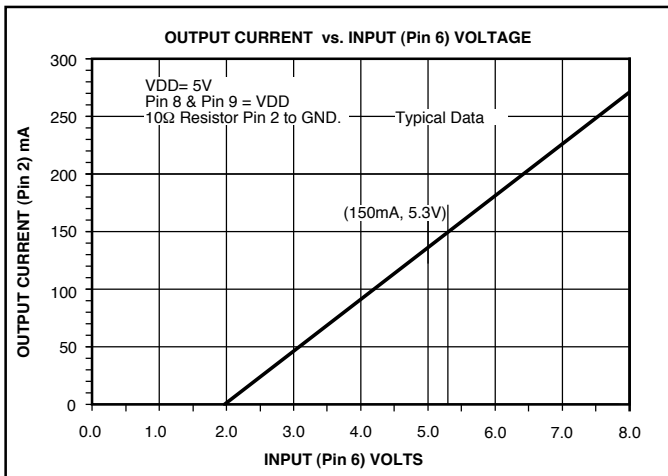
Graph 3

Constant Power Mode



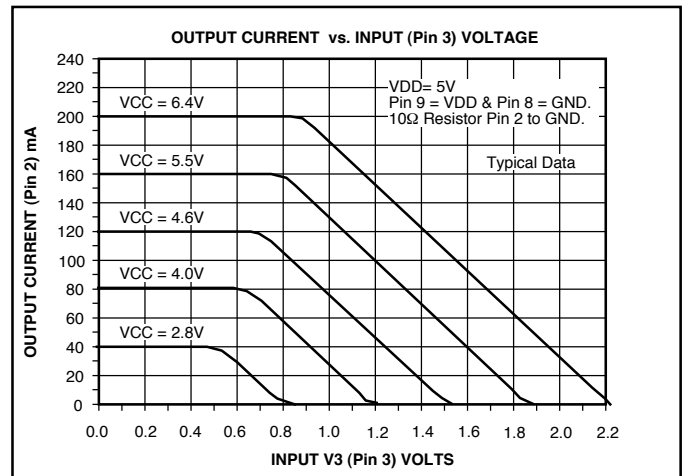
Graph 4

Constant Current Mode



Graph 5

Constant Power Mode



Graph 6

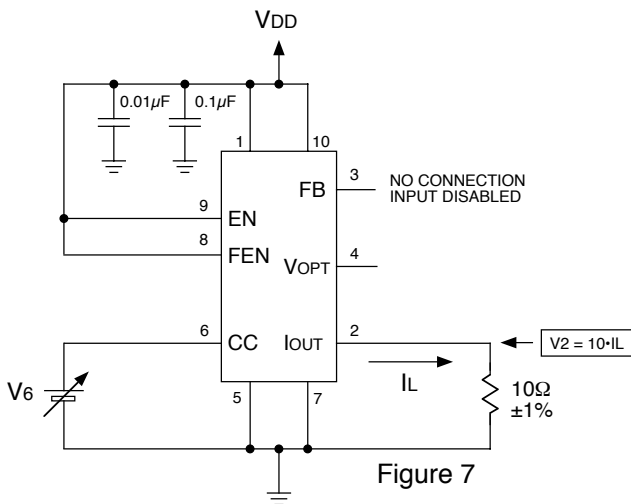


Figure 7

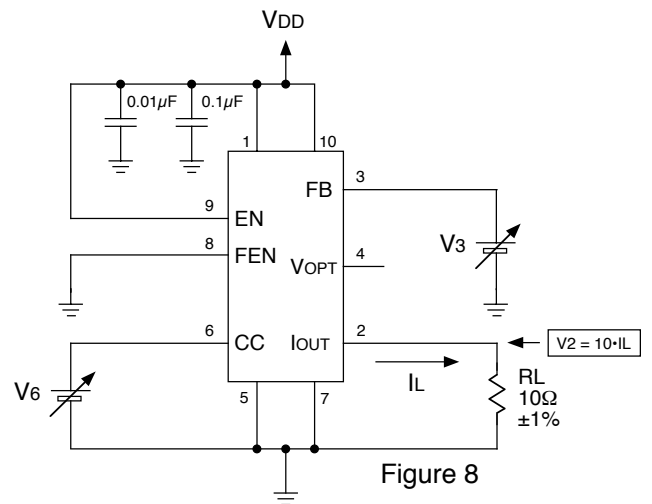


Figure 8

Graphs 3 and 5 are produced using the schematic shown in Figure 7.

Graphs 4 and 6 are produced using the schematic shown in Figure 8.

DN6330

The DN6330 can be used in Constant Current Mode or in Constant Power Mode. In Constant Current Mode, a programing voltage applied at Pin 6 , the Current Control (CC) input, sets a constant current out[ut to the Laser Diode which does not vary with changes in Load (the supply voltage VDD must be constant) . In the Constant Power Mode, the feedback current from a laser's backfacet photodiode (normally reverse biased as shown in Figure 1) is used to adjust the HY633 output current to help oppose reduction in laser diode light output caused by aging.

Feedback is enabled by tying Pin 8, feedback enable (FEN), to ground or leaving it open. A voltage proportional to the magnitude of feedback current can be monitored at Pin 4, optical feedback output (VOPT). This voltage will provide a relative measure of the laser's optical output.

Feed from the laser's reverse biased backfacet photodiode is connected to Pin 3, the Optical Feedback Input (FB). The input resistance of this input to ground is 20K Ω . Current feedback can vary widely from microamps to milliamps for different laser diode modules. Therefore, the voltage presented to Pin 3 usually must be adjusted with a parallel resistance to ground (Figure 1).

Increasing the voltage at Pin 3 will decrease the current drive to the laser diode. So, as the Laser ages and the light output from the photodiode decreases , feedback current and the resultant output voltage at Pin 3 will also fall thereby increasing current drive to the Laser in order to maintain a more constant light output. Feedback voltage will generally range from 0.8 Volts to 2.0 Volts. See Figures 4 and 6.

As feedback will limit the maximum current output available to the Laser Diode, it should be adjusted down so that there is only sufficient range to counteract laser aging effects. To accomplish this follow this procedure..

1. Connect the HY6330 as illustrated in Figure 1 (Pin 8 and Pin 9 are connected to VDD).
2. Starting at zero volts, Increase the Input Control Voltage (CC) to Pin 6 until the desired Light output from the laser Diode is achieved.
3. Enable the Feedback (FB) control by grounding (EN) Pin 8.
4. Using the 10K Ω potentiometer from Pin 3 to ground Figure 1 attenuate the feedback voltage at Pin 3 until the light output is reduced by the amount predicted by the Laser Manufacturer over its expected life. For example, if the expected aging light reduction is given as 15 %, reduce feedback voltage until laser diode light is reduced by 15 % to 20 %.
5. Increase the Current Control Input (CC) Pin6 until the desired light output is restored.

The reduced feedback from the Laser Diode's backfacet photodiode as the laser ages will cause the DN6330 to increased current drive to counteract this effect. To maintain light output precisely, some gain must be added to the optical feedback. The required gain is highly dependent on the particular laser diode in use.