PCO-6131 Pulsed/CW Laser Diode Driver Module Datasheet

Precision Pulse Control

The PCO-6131 is a compact, OEM-style high power pulsed current source designed to drive diode lasers, bars and arrays in pulsed, QCW or CW modes. It delivers output current variable from 1 A to 125 A, pulse widths variable from <100 ns to DC, and pulse repetition frequencies variable from single-shot to 500 KHz at duty cycles up to 100%.

The PCO-6131 features a user-adjustable variable rise time control. This innovative feature allows the user to adjust the rise time within a range of <30 ns to >2.5 µs by means of a PCB-mounted potentiometer, to optimize the driver's rise time for the user's application.

The PCO-6131 is based on a hysteretic, average current, switch-mode regulator. This type of regulator is a variable frequency, variable pulse width design which maintains current in an energy storage inductor between a minimum and maximum level. The ripple is limited to the minimum and maximum current determined by the hysteretic controller. The regulator is started when the TTL "enable" line is taken high and runs as long as the enable is high. The use of the hysteretic regulator provides a large input range and high efficiency.

A shunting switch shorts the output of the regulator until output current is needed. The pulse is generated by opening the shunt switch for the length of the input pulse. The pulse rise and fall times are then limited only by the stray/parasitic capacitance and inductance of the shunting switch and output leads.

No power is dissipated in the driver until it is enabled. When enabled, at 125 A maximum output approximately 75 W is continuously dissipated in the driver to maintain the current in the energy storage inductor.

This architecture provides a high-performance driver in a small form factor, with high operating efficiency and low stored energy. At 125 A output current, the stored energy in the driver is approximately 7 Joules, dramatically lower than the stored energy in comparable linear current sources.

System Operation

The PCO-6131 requires user-supplied +24 VDC support power, a CMOS (+5 V) gate signal, and a TTL-level enable/disable signal. The high current output is derived from the +24 VDC input. The output pulse width and frequency are controlled by the gate signal. The output current amplitude is controlled by a PCB-mount potentiometer.

To protect the laser diode and the driver, circuitry is incorporated into the driver that disables the output if the +24 VDC support power drops below 18 V. Clamp diodes are incorporated into the output network to protect the laser diode against reverse voltage conditions.

The rugged, compact design and high-power capability of the PCO-6131 make it an excellent OEM choice for driving high power laser diodes.

The PCA-9155 optional current monitor is a 0.002 Ohms resistor with a 50 Ohm series termination. When terminated into 50 Ohms, the output is the equivalent of a 0.001 Ohm resistor with scaling of 1000 A/V and can be viewed with an oscilloscope providing a straight-forward means to observe the diode current waveform in real-time. The resistor is in the negative lead and the BNC shield is connected to the negative out.

Ordering Information

PCO-6131	Diode Driver Module
PCA-9160	1-Meter Output Stripline Cable
PCA-9155	Optional Current Monitor Board

The PCO-6131 is provided with a mating I/O connector and sockets, and a 1-meter output stripline cable assembly.

For more information: 970.493.1901 or sales@directedenergy.com

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Pulse Amplitude

Output Current Range	0 A to 125 A
Means Of Adjustment	Trimpot mounted on PCB, or external 0-5 V or 0-10 V Analog Voltage, jumper-selectable.
Output Polarity	Positive
Pulse Rise Time	Variable <30 ns to >2.5 µs (10%-90%) , user-adjustable trimpot mounted on PCB
Pulse Width	<100 ns to DC
Pulse Frequency Range	Single Shot to 500 KHz
Maximum Duty Cycle	100%
Output Pulse Ripple/Droop	~2 A, (<2% at 125 A output)
Jitter	<3 ns First Sigma
Efficiency	>75% at 50% duty cycle, 125 A output
Output Connector	High Current DSUB, PCB-Mounted

Diode Forward voltage

Amplitude	20 V maximum

Gate Input

Type	Positive Edge Trigger
Gate Input	+5 V CMOS

Current Monitor Optional PCA-9155

Current Monitor	1000 A/V terminated into 50 Ω ±3% of the actual current
Current Monitor Connector	BNC

Control Functions

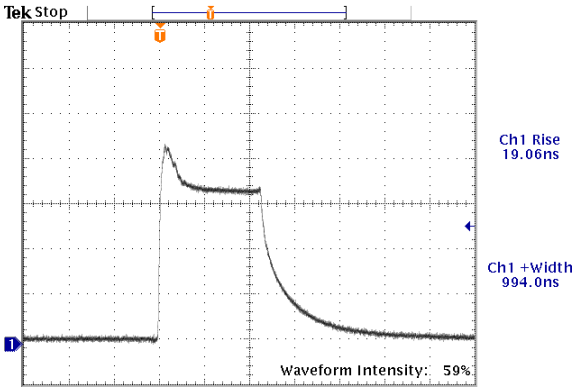
Output Enable/Disable	TTL Input, High = Enabled

General

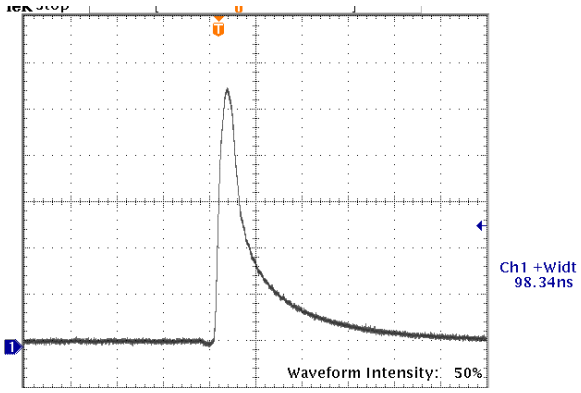
Input Power	+24 VDC ±10% unregulated
Operating Temperature	0°C to 40°C
Cooling	Air cooled
Dimensions (H X W X D)	8.4 cm x 20.3 cm x 16.5 cm

Specifications are subject to change without notice.

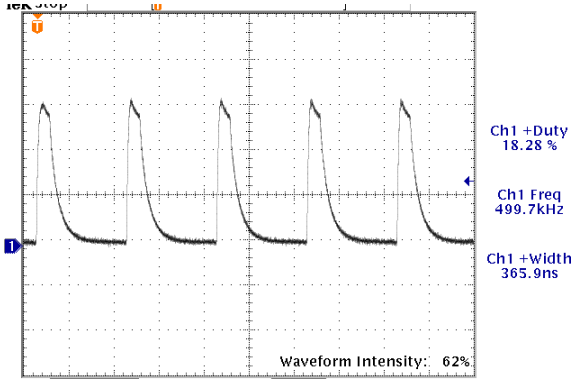
*The idle power consumption (power consumed when the driver is enabled but not pulsing) varies non-linearly with output current, and can be approximated by the formula $P_{IDLE}=I^2$ x 0.023 where I is the output current setpoint. When pulsing, the switching losses (P_{SW}) are about 30 W. Therefore the 24 VDC power requirements can be approximated by the formula P_{SW} + [I_{OUT} V_{OUT} + I_{OUT}^2(0.030)]DutyCycle + P_{IDLE} (1-DutyCycle) where V_{OUT} is the diode forward voltage and DC is the duty cycle. For example, at 40 A output current, 10 V diode voltage and 30% duty cycle, the power consumption is 30W + [40A x 10V + 40A² x 0.03] x 0.3 + [40A² x 0.023] x (1-.3) = 190W. The +24 VDC support power should be sized to provide this average power.



<30 ns Rise Time, < 750 ns Fall Time, 120 A Output



<100 ns Minimum Pulse Width, 125 A Output



500 KHz Frequency, 125 A Output

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