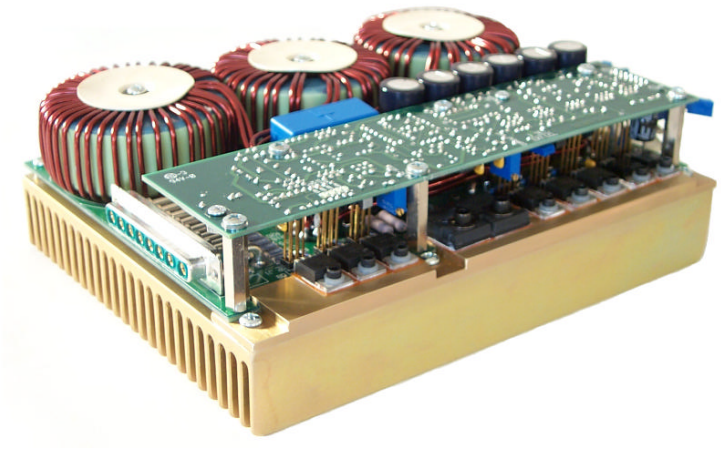
PCO-6130 PULSED/CW LASER DIODE DRIVER MODULE



- **Economical OEM Module**
- **0A To 125A Output**
- **20V Maximum Output Voltage**
- **2.5kW Maximum Average Output Power**
- **User-Adjustable Variable Rise Time**
- **<600ns To DC Pulse Width**
- **Repetition Frequency Single-Shot To 250KHz**
- **Current Monitor Output**

The PCO-6130 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 1A to 125A, pulse widths variable from <600ns to DC, and pulse repetition frequencies variable from single-shot to 250KHz at duty cycles up to 100%.

The PCO-6130 features a user-adjustable variable rise time control. This innovative feature allows the user to adjust the rise time within a range of <200ns to >5µs by means of a PCB-mounted potentiometer, to optimize the driver's rise time for the user's application.

The PCO-6130 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 125A maximum output approximately 75W is continuously dissipated in the driver to maintain the current in the energy storage inductor (see note #1 on next page for more information).

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

The PCO-6130 requires user-supplied +24VDC support power, a CMOS (+5V) gate signal, and a TTL-level enable/disable signal. The high current output is derived from the +24VDC DC input. The output pulse width and frequency are controlled by the gate signal. The output current amplitude is controlled by a PCB-mount potentiometer. A current monitor output may be viewed with an oscilloscope, providing a straight-forward means to observe the diode current waveform in real-time.

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

The PCO-6130 is available in two options. Option A (pictured above) is mounted on an air-cooled heatsink. Option B is provided without the heatsink, and must be mounted to a user-supplied heatsink or cold plate capable of dissipating approximately 100W.

The rugged, compact design and high power capability of the PCO-6130 make it an excellent OEM choice for driving high power laser diodes.

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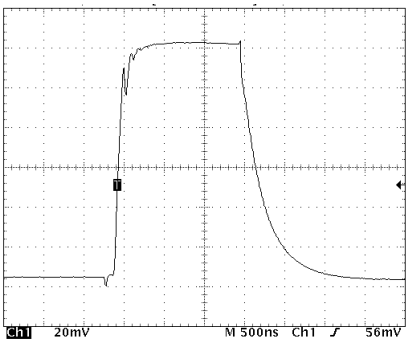
Specifications

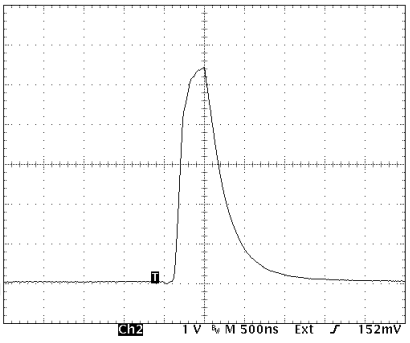
PARAMETER	VALUE
PULSE OUTPUT CURRENT	
Amplitude Range	0A to 125A
Means Of Adjustment	Trimpot mounted on PCB, or external 0-5V or 0-10V Analog Voltage Program, jumper-selectable
Output Polarity	Positive
Pulse Rise Time	Variable from <200ns to >5µs (10%-90%) , user-adjustable through trimpot mounted on PCB
Pulse Width	<600ns to DC
Pulse Recurrence Frequency Range	Single Shot to 250KHz
Maximum Duty Cycle	100%
Output Pulse Ripple/Droop	~2A, (<2% at 125A output)
Jitter	<3ns First Sigma
Efficiency	>75% at 50% duty cycle, 125A output (1)
Output Connector	High Current DSUB, PCB-Mounted
DIODE FORWARD VOLTAGE	
Amplitude	20V maximum
GATE INPUT	
Type	Positive Edge Trigger
Gate Input	+5V CMOS
CURRENT MONITOR OUTPUT	
Current Monitor	1000A/1V terminated into 50Ω, ±3% of the actual current
Current Monitor Connector	SMB, PCB-Mounted
CONTROL FUNCTIONS	
Output Enable/Disable	TTL Input, High = Enabled
GENERAL	
Input Power	+24VDC unregulated (1)
Operating Temperature	0C to 40C
Cooling	Option A (with heatsink): Air cooled (2) Option B (without heatsink): Cold plate capable of dissipating ~75W at 125A output current (1)
Dimensions (H X W X D)	Option A: 6" x 8" x 2.7" (15.2cm x 20.3cm x 6.9cm) Option B: 6.25" x 8" x 1.5" (15.9cm x 20.3cm x 3.8cm)
SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE	

(1) 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 0.005 where I is the output current setpoint. When pulsing, the switching losses (P_{SW}) are about 30W. Therefore the 24VDC power requirements can be approximated by the formula P_{SW} + [$I_{OUT}V_{OUT}$ + I_{OUT}^2(0.015)]DC + P_{IDLE} (1-DC) where V_{OUT} is the diode forward voltage and DC is the duty cycle. For example, at 80A output current, 10V diode voltage and 30% duty cycle, the power consumption is 30W + [80A x 10V + 80A^2 x 0.015].3 + [80A^2 x 0.005](1-.3) = 322W. The +24VDC support power should be sized to provide this average power.

(2) Model number PCO-6130 Option A is mounted on an air-cooled heatsink. Option B requires a customer-supplied heatsink or cold plate capable of dissipating ~75W (when the driver is operated at 125A output, see #1 above).



<200ns Rise Time, <600ns Fall Time, 120A Output
(500ns/Div horizontal scale, 20A/Div vertical scale)

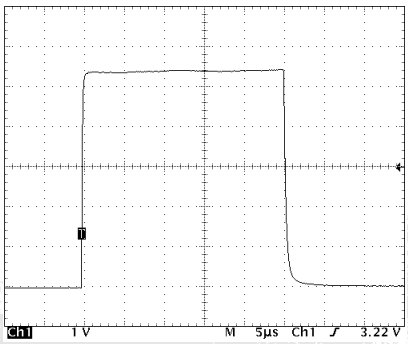


<600ns Minimum Pulse Width, 120A Output
(500ns/Div horizontal scale, 20A/Div vertical scale, measured at the load)

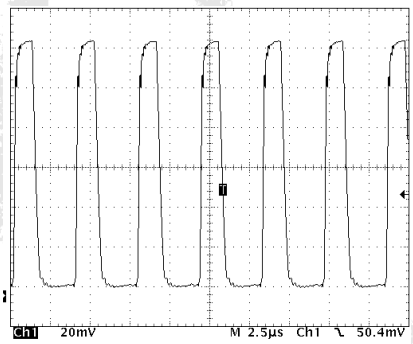
Ordering Information

PCO-6130 Option A	With Heat sink
PCO-6130 Option B	Without Heat sink (Requires user-supplied heat sink or cold plate)

Both models are provided with a mating I/O connector and sockets, and a 1-meter output stripline cable assembly.



Typical Output Waveform 25us Pulse Width, 120A Output
(5µs/Div horizontal scale, 20A/Div vertical scale)



250KHz Frequency, 120A Output
(2.5µs/Div horizontal scale, 20A/Div vertical scale)

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