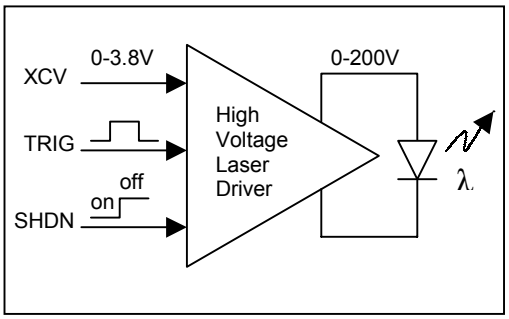
ELECTRO-OPTIC DEVICES, INC.

ETX-10A

Single Supply, 5-Volt, Pulsed Laser Diode Driver With Integrated HV Power Supply

FEATURES:

- Compact pulsed laser diode driver design.
- Integrated high voltage power supply.
- Single 5V supply requirements (3.3V also available).
- Pulse widths from 5 to 30 nanoseconds (typically).
- PRF up to 10 kHz with integrated power supply. (see specifications)
- PRF in excess of 50 kHz with external HV power supply. (eg. model EHV-4)
- Discharge current up to 75 Amps (pk). (see specifications)
- Peak discharge current may be set locally via trim-pot or by external control voltage (XCV).
- Pulse width can be modified via selection of capacitance and resistance banks.
- Universal laser mounting pads accommodate most 2 and 3 lead pulsed laser diodes such as all OSRAM (Infineon) SPL series diodes and Perkin-Elmer “R”, “S”, “U” and “W” pkgs.
- ETX-10A Laser Drivers are available with OSRAM SPL series lasers installed with test data. Optional: extended test data including Po vs. Vdis plot and laser emission spectral plot.
- Orthogonal mount of laser diode provides minimum inductance. Facilitates a complete Faraday cage for reduced EMI when a metal shield (available separately) is attached to the PCB’s perimeter ground plane.
- Compact PCB just 2.250 x 1.125 inches.



DESCRIPTION:

The ETX-10A is a compact pulsed laser diode driver with an integrated 0-200V high voltage switching power supply. Integrating the high voltage power supply into this pulsed laser driver, and eliminating the need for an external high voltage supplies, allows the ETX-10A to be powered by a single 5V power supply. This minimizes extra design work, board space, and cost of an external power supply by keeping the required high voltage supply needs on-board.

A modifiable pulse width gives a configurable PRF up to 10kHz (integrated power supply) or in excess of 50KHz (High performance external power supply: eg. model EHV-4).

Minimizing pin-out, control is obtained by three control signals: XCV, SHDN and TRIG. XCV enables ability to externally adjust laser discharge voltage, which can also be done by trim-pot VR-1, and will indirectly modify the peak discharge current. SHDN shuts down the ETX-10A to enter a power saving mode that draws only 10uA of current from the supply. TRIG triggers a high voltage pulse, which in turn can be monitored by the discharge monitor (DM) pin for more accurate measurements.

Flexible design layout provides accommodates most 2 and 3 leaded pulse laser diodes. Orthogonal mount of laser diode provides minimum inductance that, when a metal shield (available separately) is attached to the PCB’s perimeter ground, will facilitate a complete Faraday cage for reduced EMI. PCB is very compact with board dimensions of 2.250 x 1.125 inches.

ETX-10A pulsed laser diode drivers are available with OSRAM SPL series lasers installed and tested. Package is also provided with test data and optional extended test data that includes Po vs. Vdis plot and laser emissions spectral plot.

P1 Connections:

The ETX-10A implements an eight-conductor interface (P1) using 1mm pitch flat flex cable. The ETX-10A is available with or without the 8 pin 1mm FFC connector installed (see ordering codes). The pin connections are as follows:

Pin	Signal	Description
1	**DM**	Discharge Monitor Output
2	**GND**	Ground
3	**SHDN**	Shutdown
4	**GND**	Ground
5	**XCV**	External Control Voltage
6	**+5V**	Power Supply
7	**N.C.**	No Connection
8	**TRIG**	Trigger Input

Vext. – External Discharge Voltage Input / Test Point:

Pin	Signal	Description
1	**GND**	Ground
2	**Vdischarge**	Discharge Voltage (0 – 200 Vdc)

Signal Details:

DM, Discharge Monitor Output – This output has a negative going rapid transition that is temporally coincident with the laser pulse emission. In laser ranging applications, this signal can be considered time zero (t_0) and is normally viewed by a fast voltage comparator in the user's system.

TRIG, Trigger Input – This CMOS/TTL compatible input triggers the ETX-10A to fire the laser diode. The driving circuit should be capable of sourcing a trigger pulse of at least 3.5Vdc peak and at least 50ns width. High repetition rate applications should make certain to limit the trigger pulse width as the discharge capacitor bank cannot begin to recharge while the trigger input remains logic HI.

SHDN, Shutdown – This CMOS/TTL compatible input disables the ETX-10A switching supply while in the logic HI state. The Shutdown (SHDN) input can be used to minimize current consumption and gate switching noise during sensitive operations (see AN-3, A Basic Time-of-Flight Pulsed Ranging System).

XCV, External Control Voltage – The External Control Voltage (XCV) analog input controls the laser discharge voltage. The XCV input can be varied over the range 0V – 3.8 Vdc to proportionately set the laser discharge voltage over the range of 0V to 200Vdc.

Universal Laser Diode Mount:

The laser diode mounts to the bottom of the ETX-10A (the side opposite components). Be certain to match Anode (A) and Cathode (K) connections according to laser diode specifications. Failure to do so can result in damage to the laser diode. The ETX-10A features a universal laser diode pad configuration. The pad spacing and hole sizes accommodate most popular laser diode packages including all OSRAM SPL series laser diodes and Perkin-Elmer's "R", "S", "U" and "W" style packages. In each case, the hole openings are such that the diode can be installed with the laser emitting area centered on the ETX-10A mounting holes. For plastic encapsulated lasers (OSRAM SPL and P-E type "W") which have the laser die offset from the centerline of the leads, the outer laser mounting holes on the ETX-10A are large enough to allow the laser diode to be counter-offset by approximately 0.2 mm to allow better centration on the ETX-10A mounting holes.

CAUTION: METAL PACKAGED LASER DIODES ARE CHARGED TO Vdischarge POTENTIAL! Care must be taken to avoid shock hazard and to prevent shorting contact to metal mounting features.

Local Adjustment of the Laser Discharge Voltage:

The laser discharge voltage, and correspondingly the peak laser current, can be adjusted at trim pot VR1. The discharge voltage is variable over the range of 0 to 200Vdc.

Modifying Peak Current and Pulse Width:

The peak current discharged through the laser is proportional to the laser discharge voltage (the potential across the capacitors) and the total capacitance of the capacitor bank. To increase the peak current through the laser, the discharge voltage should be increased. This will, however, increase the pulse width slightly.

Pulse width can be modified by choice of total discharge capacitance and effective series resistance. Capacitance as low as a couple hundred picofarads can develop very short and intense laser pulses when minimal series resistance (Rbank) is used.

The standard configuration for the ETX-10A provides a capacitance bank of 4nF (total) and a series resistance of 0.55 Ohms. This selection provides a nominal pulse width near 15ns at a discharge voltage of 50Vdc. The ETX-10A can accommodate up to five discharge capacitors.

Recommended Vdischarge Operating Range:

Operation at low discharge voltages leads to increased sensitivity to pulse width variations. Depending upon the installed laser diode, discharge voltages less than 20 – 40 Volts should be avoided. If lower laser output power is desired, use less discharge capacitance in the Cbank to allow a higher discharge voltage.

ETX-10 OPERATING SPECIFICATIONS:

PARAMETER	MIN.	TYP.	MAX.	UNIT
Supply Voltage (Vcc)	4.8	5.0	5.2	V dc
Supply Current (Icc)[1]	15	25	60	mA dc
Supply Current during shutdown (Ishdn)		10		µA dc
Laser Discharge Voltage (Vdis)	5	50	200	V dc
Pulse Repetition Rate (continuous)[2]			>50000	Hz
Pulse Repetition Rate (contin. Ipk=20A,Vdis=55V)[3]			6000	Hz
Pulse Repetition Rate (contin. Ipk=30A,Vdis=85V)[3]			2500	Hz
Pulse Repetition Rate (contin. Ipk=40A,Vdis=115V)[3]			1200	Hz
Pulse Repetition Rate (contin. Ipk=50A,Vdis=145V)[3]			700	Hz
Pulse Repetition Rate (contin. Ipk=60A,Vdis=180V)[3]			400	Hz
Maximum Current Pulse Amplitude (peak)[4]		60	75	A
Current Pulse Width (at 50% amplitude)[4]	5	15	30	ns
Trigger Pulse Amplitude (peak)	3.3	5	7	Vdc
Trigger Pulse Width (at 50% amplitude)	30	50	200	ns
Shutdown Time (t_{shdn})[5]		5		µs

NOTES:
1. Dependent upon repetition rate, discharge voltage and capacitance bank.
2. May require external laser power supply – dependent upon peak current, pulse width and repetition rate. NOTE: Excessive heat dissipation may damage capacitor bank or laser diode. Do not exceed 125mW average dissipation per discharge capacitor without forced cooling.
3. Measured load: 1" length of 18Ga. wire with current probe attached. Vdis measured at Vext. test point using internal laser power supply @ 25ºC, pulsewidth typically 15ns @ Vdis = 100Vdc for standard ETX-10A configuration: 4nF capacitance bank + 0.55Ω series resistance.
4. Dependent upon laser package inductance, discharge capacitance, series resistance and laser voltage.
5. Time it takes the ETX-10A to enter shutdown mode from the instant the SHDN pin becomes high.

ETX-10A Ordering Options:

ORDERING CODES:

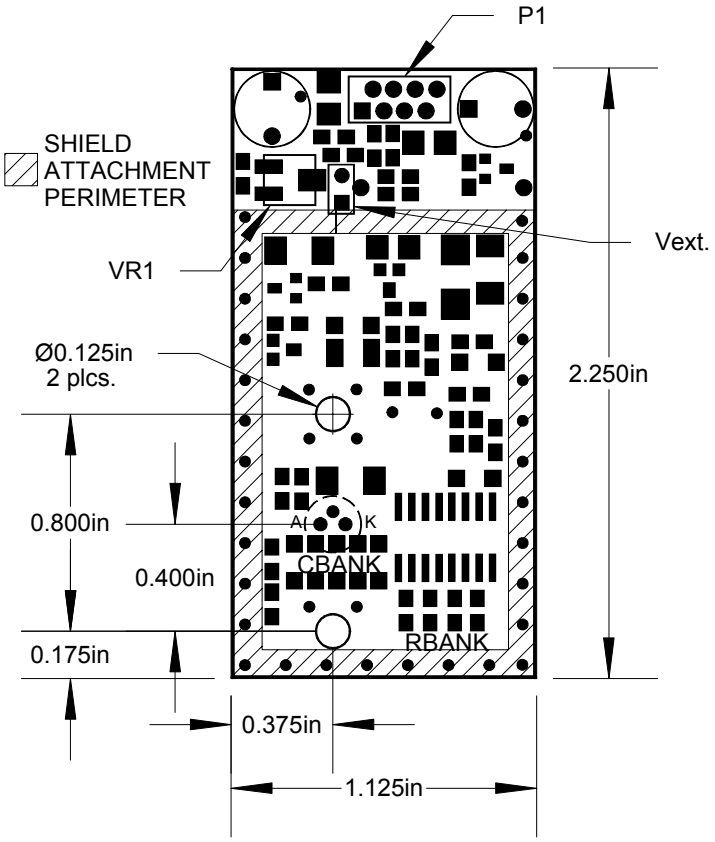
ETX-10A	ETX-10A laser driver **without** 8 position connector, no Laser
ETX-10A-C	ETX-10A laser driver **with** 8 position FFC connector, no Laser
ETX-10A-85	ETX-10A laser driver, no connector, SPL PL85 Laser Diode*
ETX-10A-90	ETX-10A laser driver, no connector, SPL PL90 Laser Diode*
ETX-10A-93	ETX-10A laser driver, no connector, SPL PL90_3 Laser Diode*
ETX-10A-85-C	ETX-10A laser driver, FFC connector, SPL PL85 Laser Diode*
ETX-10A-90-C	ETX-10A laser driver, FFC connector, SPL PL90 Laser Diode*
ETX-10A-93-C	ETX-10A laser driver, FFC connector, SPL PL90_3 Laser Diode*

* includes test data indicating measured peak laser power at Vdis = 50Vdc

Accessories:

ETX-SHIELD	Brass EMI shield to fit ETX-10A and ETX-nX series laser drivers
ETX-FFC-CON	8 Position, 1mm FFC Connector, Through-hole
ETX-FFC-RIB	8 Conductor, 4" length, 1mm FFC Ribbon Cable
ETX-10A-ETD	Extended test data including Po vs. Vdis and laser spectral plots
ETX-10A-NRE	Custom pulsewidth / power output Non-Recurring Engineering

ETX-10A Mechanical Dimensions:



Performance Charts: (all data is typical)

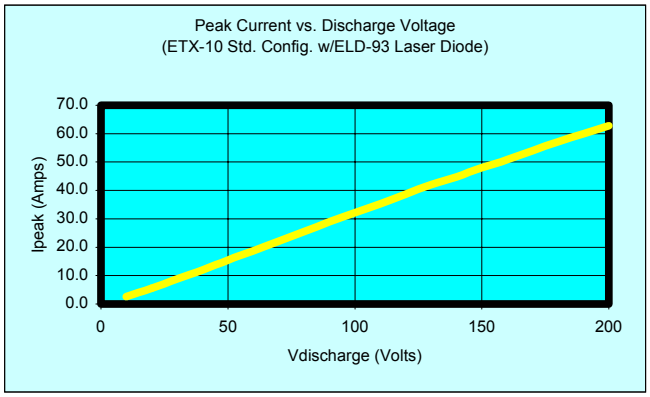


Figure 1

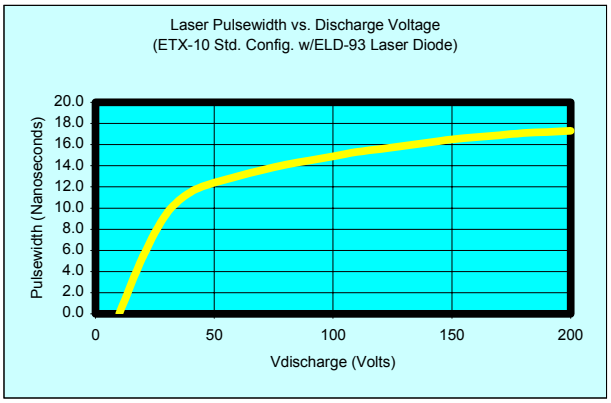


Figure 2.

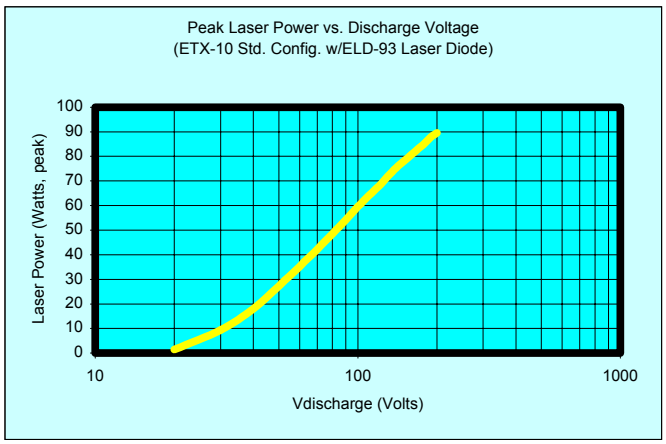


Figure 3.

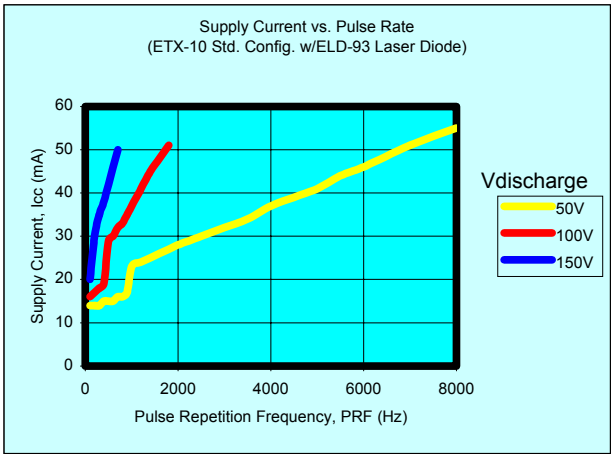


Figure 4.

Performance Charts Notes:

Figure 1. Peak forward current vs. Discharge Voltage. Data taken with standard ETX-10A configuration: Cbank = 4 x 1000pF, Rbank = 4 x 2.21Ω. Laser diode OSRAM SPL PL90_3 installed with 4mm standoff from ETX-10A to accommodate an ALS model 711 Wideband Current Probe.

Figure 2. Laser Pulsewidth vs. Discharge Voltage. Data taken with standard ETX-10A configuration: Cbank = 4 x 1000pF, Rbank = 4 x 2.21Ω. Laser diode OSRAM SPL PL90_3 installed flush to ETX-10A. Optical pulse measured with Tektronix model P6701A O/E Convertor.

Figure 3. Peak Laser Power vs. Discharge Voltage. Data taken with standard ETX-10A configuration: Cbank = 4 x 1000pF, Rbank = 4 x 2.21Ω. Laser diode OSRAM SPL PL90_3 installed flush to ETX-10A. Laser power measured with Ophir PD-2A power meter @ 905nm.

Figure 4. Supply Current vs. Pulse Rate. Data taken with standard ETX-10A configuration: Cbank = 4 x 1000pF, Rbank = 4 x 2.21Ω. Laser diode OSRAM SPL PL90_3 installed flush to ETX-10A. Trigger pulse width = 50ns.

(Specifications are subject to change)