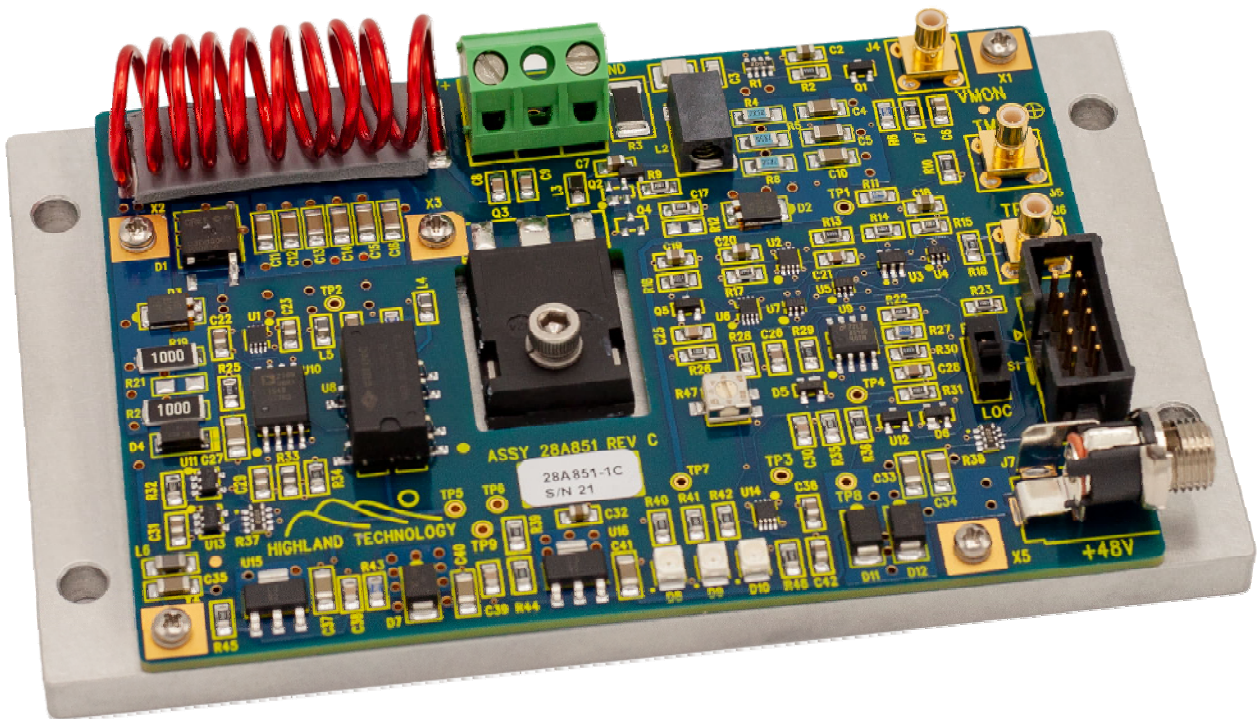


Model T850

Pockels Cell Driver



Technical Manual

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Physical contact with the T850 Pockels cell output connections can cause RF burns.

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1 Introduction

This is the technical manual for the Highland Model T850 Pockels Cell Driver.

Features of the T850 include:

- Compact, high-efficiency pockels cell driver
- Drives 250 to 1400 volts peak into capacitive load
- Pulse rate 4 MHz typical at 1000 volts
- Pulse width 7.5 nanoseconds FWHM typical
- Efficient architecture requires only 48 volts DC power at 2 amps max
- Compact assembly 3" x 4.2" x 2"
- Jitter below 30 ps RMS
- 1/200 pulse monitor output provided
- Compatible with Highland products:
 - P400/P500 4-channel benchtop digital delay and pulse generator
 - T560/T660 4-channel compact digital delay and pulse generator
 - Application-specific timing controllers
- Available as OEM product

2 Specifications

FUNCTION	Pockels Cell driver
TRIGGER INPUT	TRIG input width sets pulse amplitude. Nominal 100 ns, source-terminated 50 ohm, 5 volt pulse The falling edge of TRIG input fires shot
PULSE RATE	0 to 4 MHz at 1000 volts peak, 10 pF load
PROPAGATION DELAY	14 ns nominal, TRIG falling edge to pulse peak
POCKELS OUTPUT	Positive near-Gaussian pulse, nom 7.5 ns FWHM into 10 pF load Dynamically programmable 250 to 1400 volts Typical 30 volts average DC offset at 4 MHz trigger rate Optional AC coupling for zero average Pockels cell bias
MONITOR OUTPUTS	VMON 1/200 of Pockels drive into 50 ohm oscilloscope TMON waveform depicts major timings
JITTER	< 30 ps RMS
CONTROL	10-pin ribbon cable connector for analog control/supervision
POWER	+48 volts DC via locking barrel connector Current typ 1 A at 4 MHz trigger rate, 1KV out Wall-plug supply available for evaluation
CONNECTORS	TRIG, VMON, TMON : SMB connectors Control: 2x5 100 mil centers shrouded ribbon header Power: 2.5 mm locking barrel Pockels cell: Phoenix barrier strip
LED INDICATORS	Green POWER , blue TRIG, red ERR
PACKAGING	3.0" x 4.2" printed circuit board on 0.25" thick aluminum baseplate
COOLING	Customer cold plate required above 500 KHz

The T850 is available as an OEM/custom product. Specifications are given to illustrate functionality.

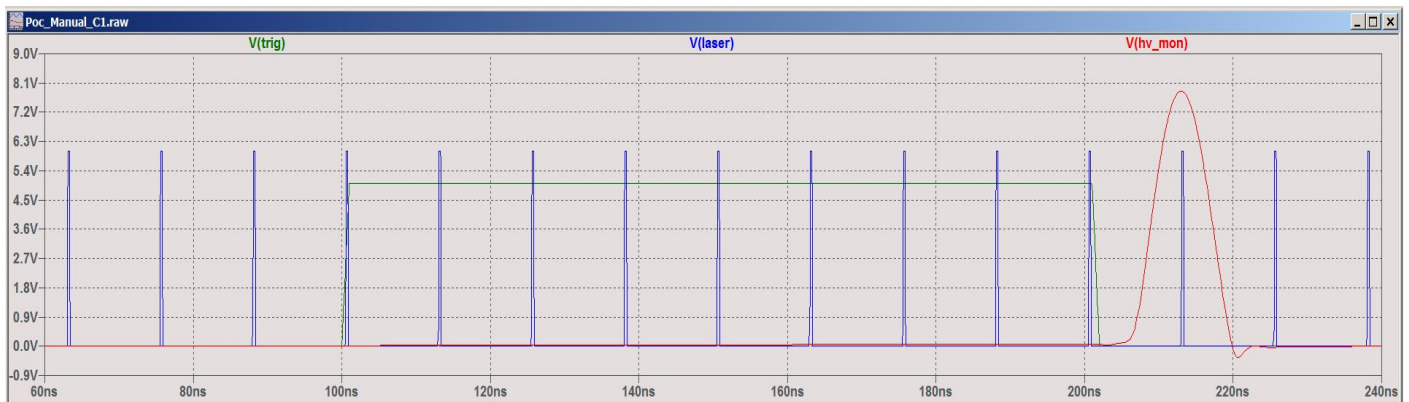
3 Power

The T850 requires 48 volts at up to 1.8 amps. The power supply should current limit at about 2 amps. The recommended locking power cable is Digikey 839-1004-ND.

4 Trigger Input

The TRIG fast pulse input sets both pulse amplitude and timing. It should be 5 volt, 50 ohm source terminated pulse, as available from the Highland T560/T660 or P500 digital delay generators.

Typical waveforms for a pulse-picking application are shown.



The blue spikes represent light pulses from a mode-locked laser, and the red trace is the Pockels Cell drive from the T850.

The TRIG input (green trace) prepares the T850 for an output pulse. The peak output voltage is proportional to TRIG width, which is nominally 100 ns at 1000 volts output.

The falling edge of TRIG input fires one HV pulse into the Pockels Cell.

Excessively long TRIG pulses will cause the internal power supply to shut down and restart after about 1 second. The T850 will also shut down if baseplate temperature is excessive or if the load is shorted.

The following is a typical output pulse into a 10 pF load:

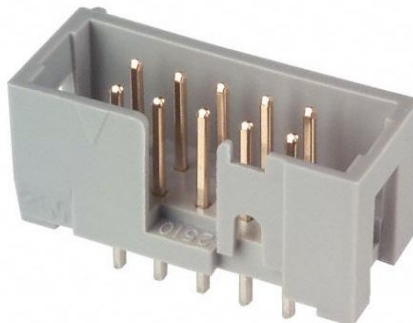


5 Monitor Output

The MON coaxial connector is provided for scope monitoring of the high voltage pulse. It will be 1/200 of the HV output pulse as seen by a 50 ohm oscilloscope. This signal is AC coupled.

6 Control Connector

The connector on the T850 is a 3M part number 2510-6002UB or equivalent, which mates with a standard 10-wire, 100-mil pitch ribbon cable connector.



The pinout is as follows:

PIN	NAME	IN/OUT	FUNCTION
1	+48	OUT	Power input monitor
2	+48	OUT	
3	ID	OUT	Unit ID 1K to +5V
4	ENAB	IN	Pulsing enable 10K to gnd
5	TEMP	OUT	Baseplate temperature 5K source
6	-	-	
7	OK	OUT	Status indicator 10K source
8	GND		Ground
9	GND	-	Ground
10	GND	-	Ground

ENAB must be pulled up to at least +3 volts to enable pulsing; it will tolerate up to +10 volts. A slide switch is provided to force the T850 on if the 10-pin ribbon cable is not used.

The OK output will go to +5 volts if the T850 is powered up and there are no error conditions. Errors include low supply voltage, over temperature, excessively long TRIG input, or shorted load. Errors result in a 1-second shutdown with automatic retry.

TEMP reports the baseplate temperature. This is a buffered thermistor voltage and is somewhat nonlinear on temperature, Vout being nominally +2.5 volts at 70 °C. The T850 will shut down and drop OK if this temperature exceeds 70 °C.

100K thermistor B=4250			
+5-----therm-----+-----vout			
15K			
gnd			
T deg C	Ohms, K	Vout	
0	368.6	0.195	
10	212.8	0.329	
20	127.5	0.526	
25	100	0.652	
30	79.05	0.797	
40	50.5	1.145	
50	33.2	1.556	
60	22.36	2.007	
70	15.42	2.465	
80	10.86	2.900	
90	7.80	3.290	
100	5.70	3.623	

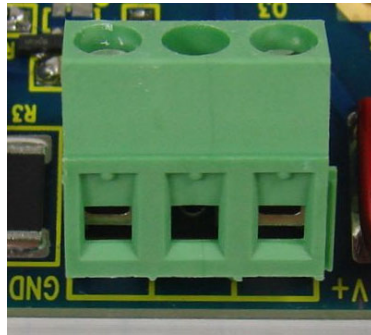
ID is a fixed 1K 1% resistor to +5 volts. It verifies the presence of the T850-1 and can also be used to check the +5 volt supply.

The +48 output can be used to check the 48 volt supply or to power a small outboard device.

Pins 8, 9, and 10 are all ground, continuous to PCB ground, Pockels cell low side, and the baseplate. A "ground everything" system architecture is mandatory to minimize EMI.

7 Pockels Cell Connections

A Phoenix type 1733583 three position barrier strip is used for the Pockels cell output. The end terminals are labeled V+ and GND, and the center terminal is not used.



Connections to the Pockels cell should be as short as possible to minimize capacitance and inductance, preferable under two inches. The T850 is not intended to drive coaxial cable. A loosely twisted pair of heavily insulated stranded wire, #20 or larger, is recommended. Insulation suited to the voltages involved, with low high-frequency losses, is required to avoid dielectric heating. Initial installations should be thermal imaged to spot possible heating.

8 Grounding

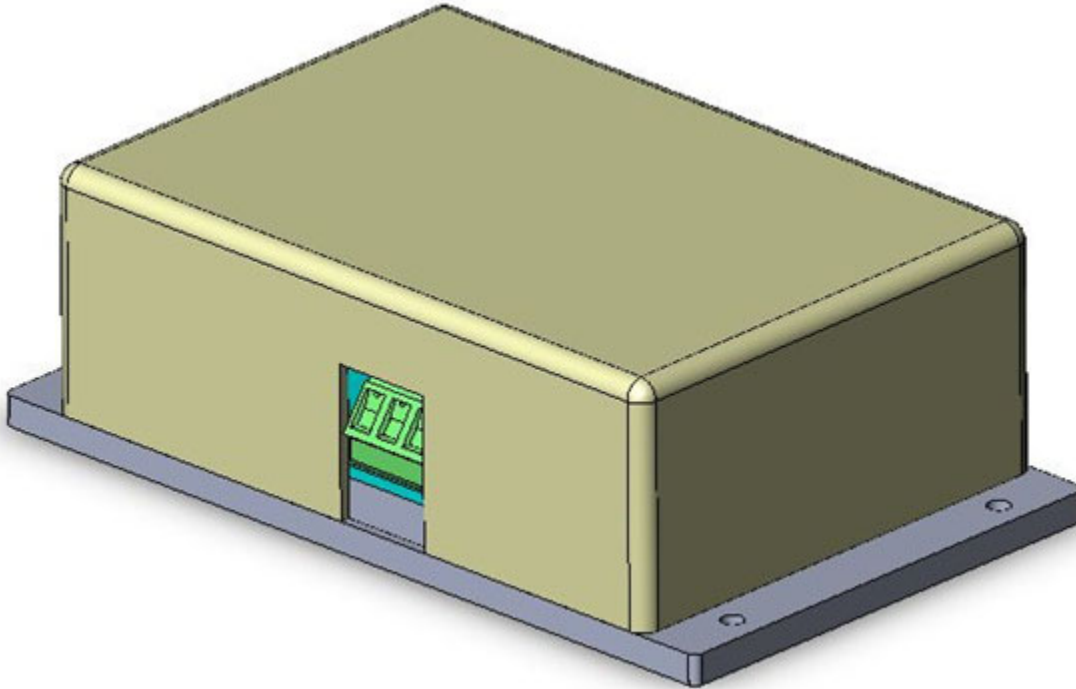
The T850 should be solidly bolted to the grounded laser or optical bench structure, and the Pockels cell should also be solidly bolted to the same surface as close to the T850 as possible.

9 Mounting and Cooling

The T850 is furnished as a PC board mated to an aluminum baseplate. The baseplate must be bolted to an optical bench, a cold plate, or a heat sink having a thermal coefficient of 0.2 °C per watt or lower. The baseplate has four mounting holes nominally 0.144" diameter.

10 Versions & Customization

The T850 is available as an OEM product customized for individual customer requirements. Consult factory for information about custom versions.



11 Revision History

Revision C September 2018
Initial T850 release

12 Accessories

J40-1: 48 volt 1 amp power supply
J53-1: 3' SMB to BNC cable
J53-2: 6" SMB to BNC cable