

**REVISIONS**


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	1	INITIAL	161201	JTR		
	A	RELEASED FOR PRODUCTION	170215	JTR		

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	J. RICHTER			161201								
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TOLERANCES	LEAD APPROVAL			DATE			FINAL APPROVAL			DATE		
	J. RICHTER			170214			J. HARWICK			170215		
DECIMAL .XX = N/A .XXX = N/A	TITLE <b>OPERATING MANUAL, DIODE DRIVER                  MODEL 787</b>											
ANGULAR X = N/A	SCALE N/A	SIZE A	FSCM 61651	SHEET 1 OF 7	DRAWING NUMBER	16-117				REV. A		

The Model 787 is a highly efficient, current regulated, low ripple tri-phase Laser Diode Driver designed to power pulsed and CW high current laser diode stacks.

## Installation:

The Driver has (4) mounting holes that are approximately 0.125" in diameter and suitable for a #4 screw. (2) are located in the corners of the PCB and the other (2) behind the power terminals. Mount the unit to (4) appropriate standoffs using #4 screws. No components are mounted on the backside of the PCB. Spacing from bottom of the PCB to the cut legs of the through hole components should not exceed 0.060".

For convection applications it is best to mount the units vertically for optimal cooling. Allow 1" clearance around the PCB for best results.

For forced cooling applications, mount the PCB so that the maximum amount of air flows across the top surface of the PCB and a smaller amount across the bottom.

For reference, the driver can run 250W continuous at 25°C with 250-300LFM. See mechanical outline drawing for further details.

## Connections:

- 1) Power input
- 2) Power output
- 3) Control and I/O

- 1) There are (2) large through holes measuring approximately 0.200" diameter in one corner of the PCB. Etched in copper above the holes is "+12V" and "GND". These holes are for the input power and are suitable for a #10 screw. Use an appropriate size wire and ring terminal for the amount of current being drawn. Input current can be calculated from the formula below:

$$I_{in} = \frac{V_{out} \times I_{out} \times N}{V_{in\_min} \times eff}$$

where

$V_{in\_min} = 11V$

$N = \#$  of parallel units

$eff =$  efficiency from graph

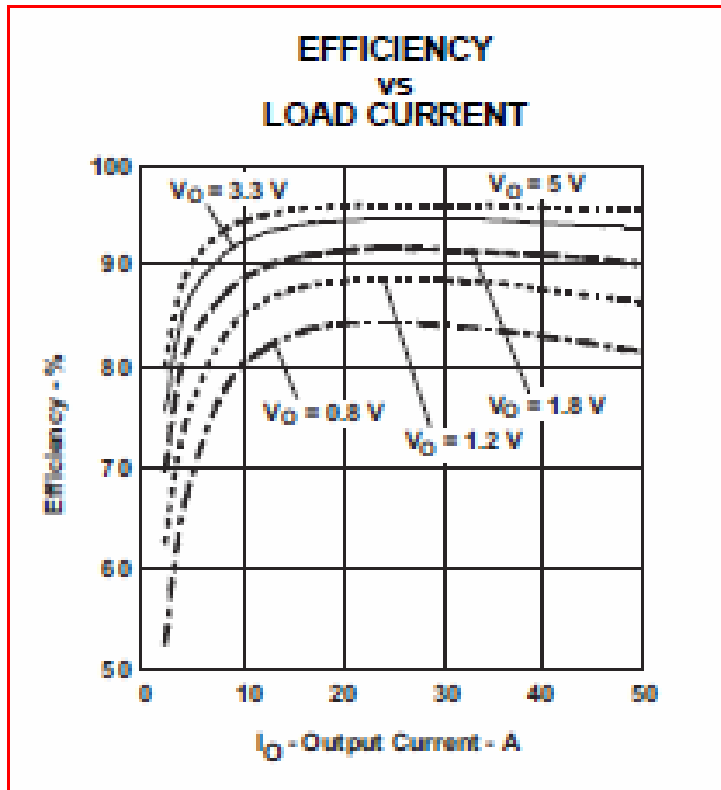


Figure 1

- 2) There are (2) large through holes measuring approximately 0.200" diameter in the adjacent corner of the PCB from the input power. Etched in copper above these holes is "A" (anode) and "K" (cathode). These holes are for the output power and are suitable for a #10 screw. Use an appropriate size wire and ring terminal for the amount of current being drawn. Output current is set using the current demand function. The output voltage will be set by the diode chosen.
- 3) Opposite the input and output power connections is a 10 pin, dual row, 0.1" pitch connector for control and I/O. The connector on the PCB is keyed and has pin 1 clearly marked with an arrow. A 10 pin ribbon cable with 10 pin IDC (insulation displacement connector) works well here. An example of a suitable mate for the PCB connector is 3M 89110-0103. The pin out is shown below:

Pin 1 Pulse  
Pin 2 GND  
Pin 3 IMON  
Pin 4 GND  
Pin 5 VMON  
Pin 6 GND  
Pin 7 Idemand+  
Pin 8 Idemand-  
Pin 9 ENABLE  
Pin 10 GND

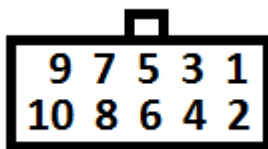


Figure 2

## I/O Signal Functions

**Pulse** – The pulse input is used to create a pulsing output current. The amplitude of the output current swings from 100% of the demanded current down to 3.5% of the demanded current. The pulse signal utilizes open collector logic. When left open circuit, the open collector pin will float up to approximately 5V and the output current will operate at the 3.5% level. When pulled low, -0.2 to 0.5V, the output current operates at the 100% level. Output current pulse frequency will be the same as the frequency on the pulse pin. Max pulse frequency ~800 Hz to 1kHz. The customer interface circuit is required to sink a minimum of 1mA at the voltages stated above. The minimum current is referred to as a simmer current and is required (2-10%) to keep the output from overshooting and having long rise times. When not in use, the Pulse pin should be tied to GND.

**IMON** – The IMON output is a representation of the current flowing in the output diode. A 0 to 5V output signal represents 0 to 50A output current (+/-2%). The output impedance of this signal is ~1k $\Omega$ .

**VMON** – The VMON output is a 1:1 representation of the output diode voltage (+/-2%). The output impedance of this signal is ~220 $\Omega$ .

**Idemand+ and Idemand-** -- These (2) signals determine the amplitude of the output current. They create a fully differential input with an input impedance of 20k $\Omega$ . Common mode voltages should remain between ground and +5V. An analog input voltage of 0 to 5V demands 0 to 50A output current (+/-2%). This function can also be

used single ended by tying the Idemand- to GND. An internal circuit will clamp the demand amplifier output if the inputs exceed ~5.35V, thereby limiting the maximum demanded output current.

**Enable** – This input determines whether the driver is outputting current or not. To enable the driver, apply a high signal between 3.3 and 24VDC. To disable the driver, apply a low signal between -0.2 and 0.5VDC or an open circuit. The input impedance of this signal is ~8 kΩ.

When enabled, the output current will go to the demanded current unless the Pulse signal is being used.

### Truth Table

Enable	Pulse(open collector)	Demand (+ to -)	Output I
H	L	5.0V	50A
H	H(open)	5.0V	1.75A (3.5% of 50A)
L or open	X	X	0A
H	L	0V	0A

Table 1

### Power Input:

Apply a regulated 11 to 13VDC input to the driver for proper operation. There is an under-voltage lockout circuit that activates and shuts the unit down at ~9.5V decreasing and re-starts the unit at ~10.3V increasing. Ensure the input supply is capable of supplying a minimum current as calculated by the  $I_{in}$  formula in Connections section 1). An additional overhead of 25% is recommended.

### Power Output:

The output voltage of the driver is determined by the voltage of the output diode load. The driver can typically handle diodes ranging from 0.8V to 5.0V but is specified at a minimum of 4.6V. The driver is current regulated.

### Connecting multiple units in parallel:

The drivers can be operated in parallel. Electrically, all connections from Unit #1 must be connected to Unit #2 and so forth. For the control I/O pins, a daisy chained ribbon cable should be used. Use multiple headers on the same ribbon cable. For power input and output, aluminum spacers/standoffs work well. The standoff spacing should not be less than 0.625". Also, support spacers/standoffs should be used at the mounting holes between boards.

When operating in parallel the following applies:

$$\begin{aligned}
 \text{Output current}_{total} &= \text{Output current}_{1\ unit} \times N \\
 \text{Input current}_{total} &= \text{Input current}_{1\ unit} \times N \\
 \text{Input impedance}_{total} &= \text{Input impedance}_{1\ unit} \div N \\
 \text{Output impedance}_{total} &= \text{Output impedance}_{1\ unit} \div N
 \end{aligned}$$

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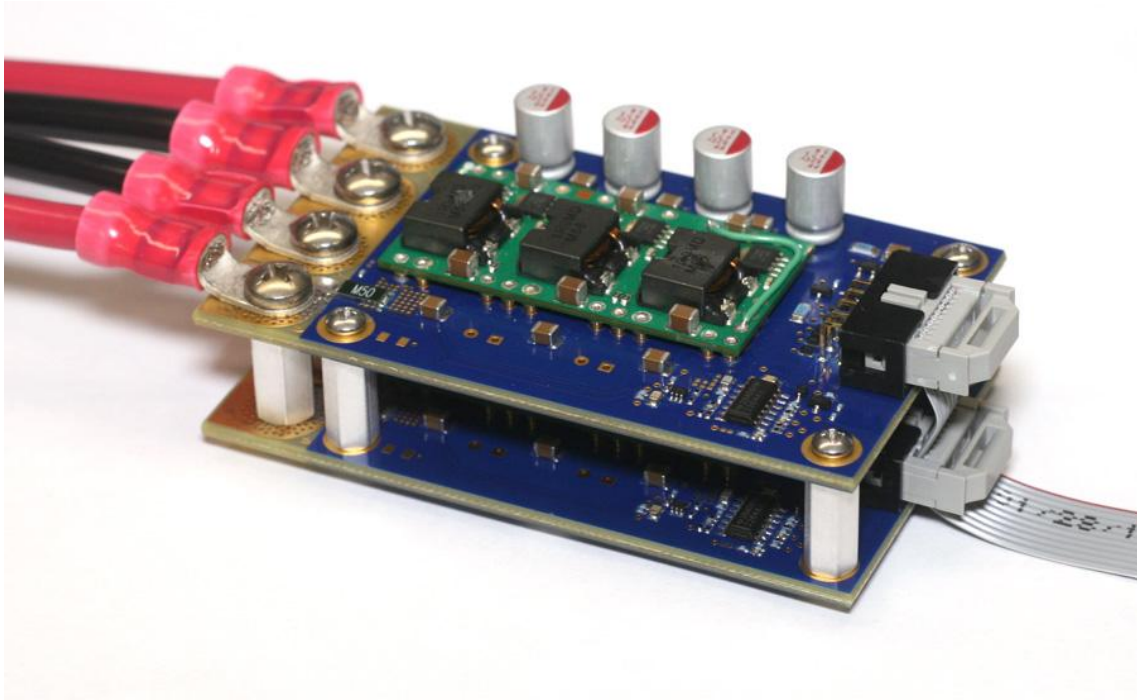


Figure 3

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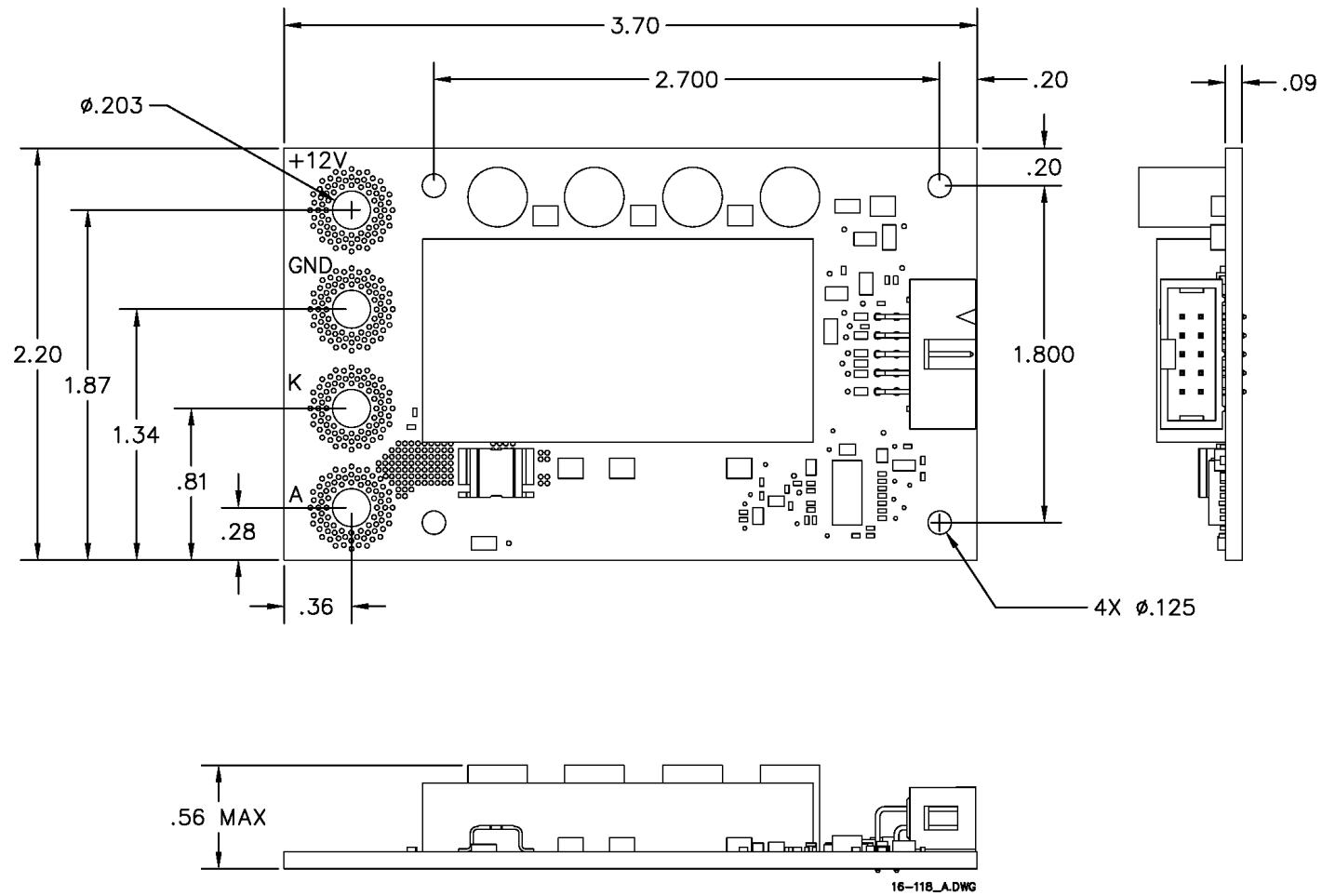


Figure 4