REVISIONS						
DCN	LTR	DESCRIPTION	DATE	CHANGED	CHECKED	APPROVED
	1	INITIAL	250805	JTR		
7775	A	RELEASED FOR PRODUCTION	251211	SWR		

FILENAME								1	SHT
24-136A.docx								A	REV

UNLESS OTHERWISE SPECIFIED:
ALL DIMENSIONS ARE IN INCHES. ALL CAPACITANCE VALUES ARE IN MICROFARADS. ALL RESISTANCE VALUES ARE IN OHMS.

ANALOG MODULES, INC.

a HEICO company

DRAWN BY	DATE	CHECKED BY	DATE
J. RICHTER	250805		
REVIEWED BY	**DATE**	**REVIEWED BY**	**DATE**
LEAD APPROVAL	**DATE**	**FINAL APPROVAL**	**DATE**
J. RICHTER	251211	E. BRUMLEY	251211

TOLERANCES

DECIMAL
.XX = N/A
.XXX = N/A

TITLE

OPERATING MANUAL, DIODE DRIVER MODEL 789

ANGULAR	SCALE	SIZE	FSCM	SHEET	DRAWING NUMBER	REV.
X = N/A	N / A	A	61651	1 OF 8	24-136	A

The Model 789 is a highly efficient, current regulated, single-phase Laser Diode Driver. It is designed to power pulsed and CW high current laser diode stacks.

CAUTION

1) Read this manual carefully before attempting to install or operate the 789 Driver.
2) This unit contains no user serviceable parts. Manufacturer's warranty is void if field serviced.
3) It is the user's responsibility to use this product in a safe manner.
4) The laser diode connections must float with respect to GND/Chassis.

ENVIRONMENTAL DATA

Operating Ambient Temperature	-20°C to +63°C
Non-operating (transport and storage)	
Ambient Temperature	-20°C to +85°C
Relative Humidity	0% to 95%, non-condensing
Altitude	0 to 2000m

Environmental Risk
The substances used in the product pose no known health or environmental risk associated with the disposal of the product at the end of their useful lives

RoHS	Directive EU 2015/863 (RoHS 3)

INSTALLATION

The Driver has (4) mounting holes that are approximately 0.125" in diameter and suitable for a #4 screw. They are in the 4 corners of the unit's heatsink. The unit can be mounted to standoffs (for low power applications) or to a cold plate (high power applications) using #4 screws.
For convection applications it is best to mount the units vertically for optimal cooling. Allow 1" clearance around the unit for best results.
For forced air 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 450W continuous at 25°C without air. See mechanical outline drawing for further details.

CONNECTIONS

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

1) There are (4) large box clamps on the PCB. Marked in white silkscreen near the clamps is their function. Clamps “Vin+” and “Vin-” are used for power input to the PCB. The clamps are suitable for stripped wire from #6 to #14AWG. Use an appropriately sized wire for the current being drawn. **Double check polarity when connecting input as damage will occur if connected backwards**. Input current can be calculated from the formula below:

$$Iin = \frac{(Vout * Iout)/_{Eff}}{Vin}$$ For CW

$$Iin = \frac{(Vout * Iout * PW * freq)/_{Eff}}{Vin}$$ For Pulsed

2) The remaining (2) box clamps are for the output and are on the opposite end of the PCB. In white silkscreen near the clamps are “ANODE” and “CATHODE”. These clamps are for the output power and are suitable for stripped wire from #6 to #14AWG. Use an appropriately sized wire for the current being drawn. Do not allow the stripped wire to extend beyond the back of the box clamps. A short circuit could be created. Output current is set using the current demand function. The output voltage will be set by the diode chosen.
The driver requires a low inductance connection to the load while pulsing. Inductance in the load cables can cause an overshoot of the output current/voltage. To mitigate this overshoot, enable supply then slow the demand signal transition time from 0 to desired current.

3) The remaining connector, J5, is an 8 pin, single row, 1.25mm pitch, Molex PicoBlade (53261-0871) connector for control and I/O. The connector on the PCB is keyed and has pin 1 clearly marked in silkscreen with “1”.

   8 pin pre-made mating harnesses are available through Electronic Distributors like Digikey. The pin out is shown below:

```
Pin 1  DEMAND +
Pin 2  DEMAND -
Pin 3  ENABLE
Pin 4  TEMP
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Pin 5  I_MON
Pin 6  SIGNAL RTN
Pin 7  +5V out
Pin 8  SIGNAL RTN
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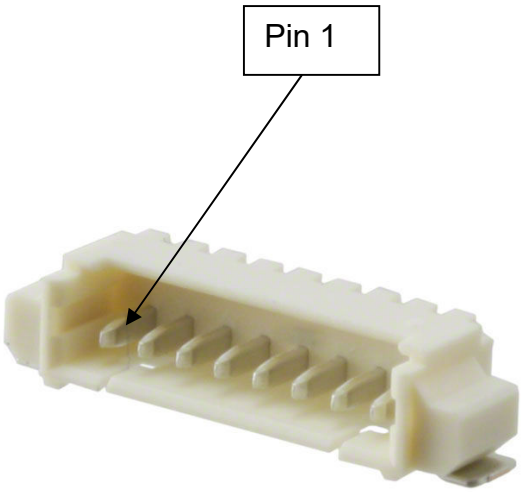
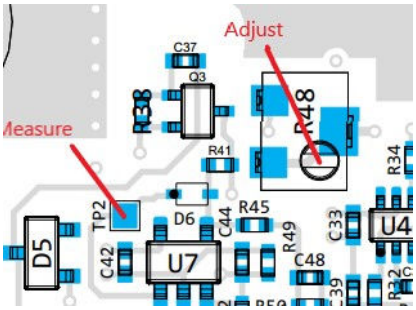


I/O SIGNAL FUNCTIONS

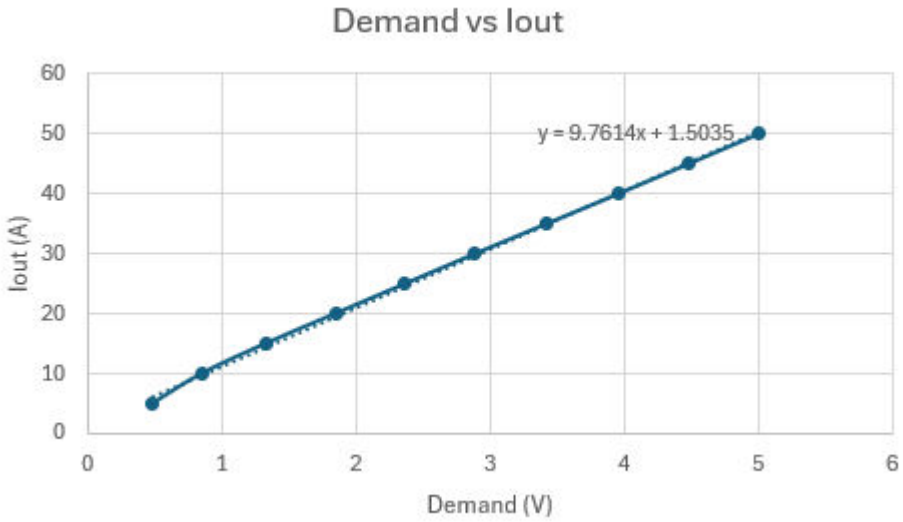
Demand+ and Demand- -- These (2) signals determine the amplitude of the output current. They create a differential input with an input impedance of 20kΩ. Common mode voltages should remain between ground and +5V. Transfer function ~ 9.8 A/V (see graph below). This function can also be used single ended by tying the Demand- to SIGNAL RTN.
An internal circuit will clamp the demand amplifier output if the demand input is too high, thereby limiting the maximum demanded output current. This demand clamp is adjustable at R48 (if installed) and is preset to just over 50A.
This clamp is meant to be a safety mechanism. If desired, the over- current point can be set lower as follows:

1) Turn R48 fully CW (12T POT).
2) Apply valid input voltage (12 to 55V). This will start the on-board +5V regulator.
3) Apply a demand voltage that corresponds to the desired max current (do not enable) (see Demand vs Iout below).
4) While measuring with a DMM from PCB TP2 to Signal Ground, adjust R48 CCW until the reading (~5.0V) begins to fall. Adjust back CW until the 5V just returns.

DWG#: 24-136
REV: A
FILE#: 24-136A.docx
DATE: 251211
DCN#: 7775



** Pulsing can also be accomplished by enabling the supply with the demand at 0 then set the demand to the desired current or pulse as necessary. The output can keep up with 30kHz CW modulation on the demand line at which point it has dropped 3dB.

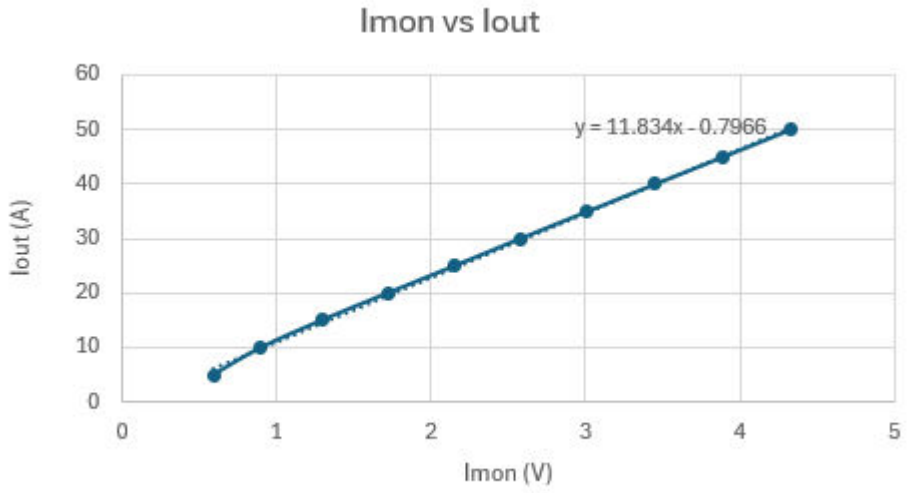


TEMP – The TEMP output is a measurement of the PCB temperature near the FETs. The output is in volts and follows the formula below:

$$T(°C) = \frac{1.8015 - V}{0.01062} + 30$$

This pin has a 1kΩ output impedance.
The unit has an auto temperature shutdown that activates when the PCB near the FETs reaches 95°C. The voltage reading on TEMP at 95°C should be 1.111V. The unit will automatically recover when the unit cools down.

IMON – The IMON output is a representation of the current flowing in the output diode. Transfer function ~ 11.8 A/V (see graph below). The output impedance of this signal is 1kΩ.



+5V OUTPUT – This pin is tied to the regulated 5V of the unit. A maximum current of 75mA is available for use on this output.

ENABLE – This input determines whether the driver is outputting current or not. To enable the driver, apply a high signal between 3.3 and 15VDC. To disable the driver, apply a low signal between 0 and 0.5VDC or an open circuit. At 15V, a minimum drive of 1.2mA is required.
This pin can also be used for pulsing. Apply a demand voltage then enable supply. The pulse width and frequency will follow the enable.

Truth Table

Enable	Demand (+ to -)	Output I
H	5.0V	50A
H	0V	0A
L or open	X	0A

Table 1

POWER INPUT

Apply a regulated 12 to 55VDC input to the driver for proper operation. The unit's switch duty cycle is defined as dc = Vo/Vin. The unit's recommended duty cycle range falls between 10% to 90%.The ideal input voltage is two times the output voltage (laser diode voltage). Ensure the input supply can provide the maximum current as calculated by the Iin formula in Connections section. An additional Power Supply overhead of 25% is recommended.
If using high-power pulses, an external input capacitor may be required.

DWG#: 24-136
REV: A
FILE#: 24-136A.docx
DATE: 251211
DCN#: 7775

POWER OUTPUT

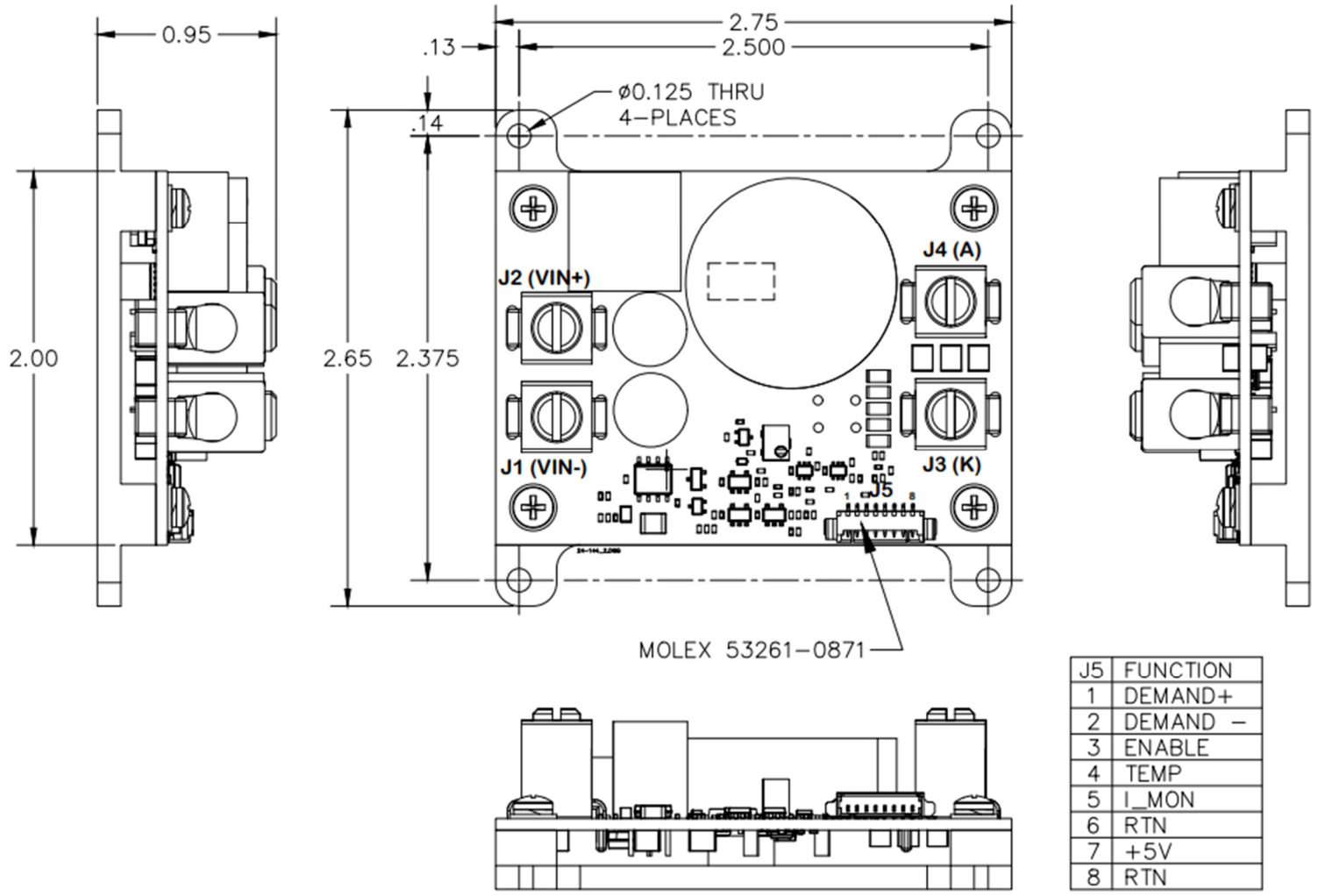
The output voltage of the driver is determined by the voltage of the output diode load. The driver can typically handle diodes ranging from 8V to 45V. The driver is current regulated.

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 cable should be used. Use multiple headers on the same cable.
When in parallel, the output current is double the demand.

DWG#: 24-136
REV: A
FILE#: 24-136A.docx
DATE: 251211
DCN#: 7775

OUTLINE DRAWING



J5	FUNCTION
1	DEMAND+
2	DEMAND –
3	ENABLE
4	TEMP
5	I_MON
6	RTN
7	+5V
8	RTN

24-144