



High Efficiency AC Input 40A 6V Laser Driver



Figure 1. Front View Photo of the AAS6V40A2



Figure 2. Top View Photo of the AAS6V40A2

FEATURES

High Efficiency: ≥ 86%

Low Temperature Rise: 35°C

No Cooling Fan Required

Maximum Output Current: 40A

Current Accuracy: ±1%

Wide Input Voltage: 88VAC ~ 132VAC & 176VAC ~ 264VAC

Wide Output Voltage: 1.3V ~ 6V

Configurable Output Current and Maximum Output Voltage

Short Circuit Protection

Over-current Protection

Over-temperature Protection

Operating Temperature: -20°C ~ 50°C

Low Cost



#### APPLICATIONS

Driving diode lasers with low noise and high stability, including fiber lasers, diode laser bars, etc.

#### DESCRIPTION

The AAS6V40A2 is an electronic module designed for driving diode lasers with up to 40A low noise current. The output current can be set by an analog voltage of 0 to 2.5V, or a potentiometer, to between 0 and 40A.

Figure 1 and 2 show photos of the AAS6V40A2.

The input voltage range can be selected to one of these 2 ranges by a mechanical switch: 88VAC to 132VAC or 176VAC to 264VAC, the frequency can be from 47Hz to 63Hz.

A high stability low noise 2.5V reference voltage is provided internally for setting the output current and maximum output voltage. This reference can also be used as the voltage reference for external ADCs (Analog to Digital Converters) and DACs (Digital to Analog Converters), which might be used for monitoring and/or setting the laser current and maximum output voltage, the so-called compliance voltage.

This laser driver module is highly efficiency, its efficiency

is > 86% efficiency. It saves energy and has low temperature rise. The module also conducts all its heat to its external chassis which serves as the heat-sink and heat conducting plate, therefore, no cooling fan is needed. Thus, there are no problems usually associated with the fan: noise, air turbulence, limited life time, etc. Mounting the module on a larger metal plate would reduce its temperature rise. Leaving the module on a free air environment is also ok.

There is an over-temperature protection circuit, in case the module's temperature gets too high, the circuit will reduce the output current and the module will be working under constant temperature mode.

There is a soft-start and soft-cut circuit in the module, which gives smooth current transactions during power-up and power-down periods.

In case there is a short-circuit at the output, the internal protection circuit will cut off the output.

The output voltage is automatically set from 1.3V to 6V while keeping the output current at a pre-set value.

The control loop is monitored in real time by an internal circuit, to make sure that it works properly. The monitoring result is sent to the LPGD node. When this pin is pulled up internally, it indicates that the loop works fine.

#### SPECIFICATIONS

Table 1. Characteristics ( $T_A = 25^\circ\text{C}$ )

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Efficiency	$\eta$	$V_{IN} = 110\text{V AC}, V_{OUT} = 6\text{V}, I_{OUT} = 40\text{A}$	-	86	-	%
Output Current	$I_{OUT}$		0	Adjustable	40	A
Current Accuracy	$\Delta_I$	$-20^\circ\text{C} \sim 50^\circ\text{C}$	-	$\pm 1$	-	%
Input Voltage	$V_{in}$		88	110	132	VAC
			176	220	264	VAC
Input Frequency	$f$		47	50	63	Hz
Output Voltage	$V_{out}$		1.3	Adaptive	6	V
Operating Temperature	$T_A$		-20	25	50	$^\circ\text{C}$



MECHANICAL DIMENSIONS

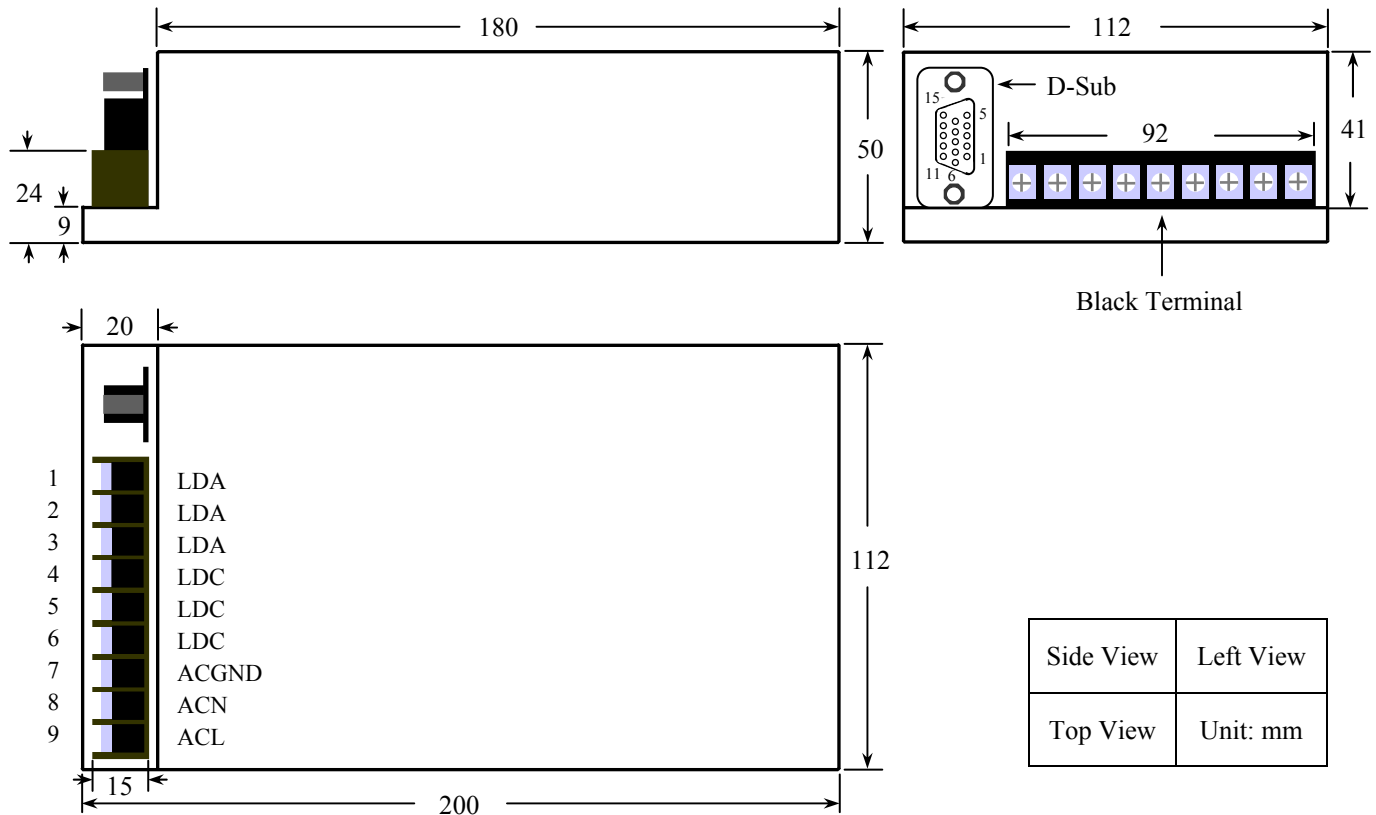


Figure 3. Pin Names and Locations

TERMINAL DESCRIPTIONS

Table 2. Terminal Introduction

#	Name	Meaning	Type	Description
<b>Black terminal</b>	1, 2, 3	LDA	Laser diode anode	Power output Connect it to the anode of the laser diode.
	4, 5, 6	LDC	Laser diode cathode	Power output Connect it to the cathode of the laser diode.
	7	ACGND	AC ground	AC ground Connect it to AC ground.
	8	ACN	Neutral wire	AC input Connect it to AC power supply.
	9	ACL	Live wire	AC input Connect it to AC power supply.
<b>D-Sub</b>	1	EN	Enable	Digital input Internal 12K pull up resistor to 5V. Pulling this pin to GND will disable the driver.
	2	LPGD	Loop good indication	Digital output When this pin is high (4V, ≤5mA), the control loop is working properly, otherwise, not properly.
	3	INTL	Interlock	Digital input Connect to safety interlock switches. Open = off, connect to GND = run.
<b>D-Sub</b>	4, 9, 15	GND	Ground	Ground Connect ADC and DAC grounds to here.
	5	LDAV	Laser diode anode output voltage	Analog output =Vout/3, Vout is laser diode anode output voltages.
	6	LIO	Laser current indication output	Analog output An output voltage of 0 to 2.5V at this pin indicates the output current being 0 to 40A linearly.
	7	LIS	Laser current set	Analog input 0V to 2.5V sets the output current from 0 to 40A



					linearly. This pin can be set by an external analog signal source, such as the output of a closed-looped op-amp, POT, or DAC. Input impedance is 10K.
8	PLSCN	Pulse control	Digital input	TTL, 1 = on, 0 = off.	
10	5V	5V	Power output	5V 5mA.	
11	5V	Optional 5V or Synchronization output	Power output	5V 5mA. Part number: AAS6V40A2.	
	SYNCO		Digital output	This pin can be used as a clock signal for synchronizing other switch mode electronics, 100KHz. Part number: AAS6V40A2SN.	
12	VLIM	Laser voltage limit set	Analog input	0V to 2.5V sets the laser output voltage from 1.3V to 6V linearly.	
13	VREF	Reference voltage	Analog output	2.5V reference voltage. To be used for setting the output current and the output voltage limit. It can also be used by external ADCs and DACs if they are used for monitoring and/or setting the output parameters.	
14	TEMPO	Driver temperature indication output	Analog output	Operating internally temperature.	

**APPLICATION INFORMATION**

Figure 4 shows a typical application circuit.

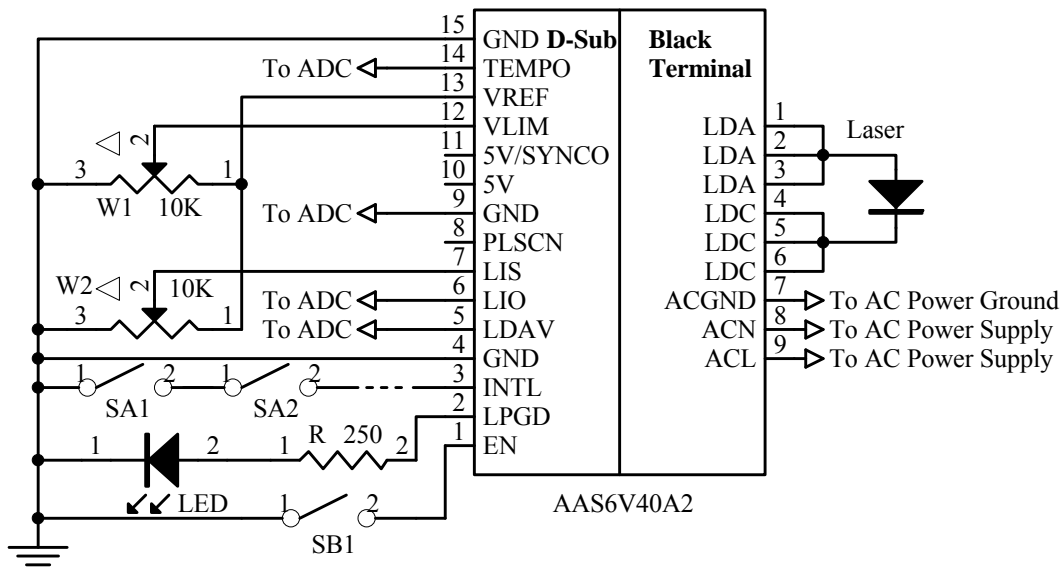


Figure 4. A Typical Application Schematic

The maximum output voltage and output current can be set respectively by internal two POTs while VLIM or LIS are respectively float. They can also be set by an external analog signal source, such as the output of a closed-looped op-amp, POT, or DAC.

The maximum output voltage can be set by the W1 in the schematic shown in Figure 4, output current can be set by the potentiometer W2. When VLIM voltage changes from 0V to 2.5V, the maximum output voltage is set to 1.3V to 6V linearly. The relationship is:

$$V_{max} = 2 \times VLIM + 1 \text{ (V)}$$

The output current formula is:

$$I_{OUT} = 16 \times LIS \text{ (A)}$$

VREF pin can be used as a 2.5V power supply, the maximum output current is 20mA.

LIO pin indicates the output current:

$$\text{Output current} = 16 \times LIO \text{ (A)}$$

The module's temperature equation is:



Temperature =  $72 \times \text{TEMPO} - 40$  (°C)

When the TEMPO voltage changes from 0 to 2.5V, the temperature indicated is -40 °C to 140°C.

SYNCO provides pulses for synchronizing other switch-mode power supplies. The frequency is about 100KHz and the duty cycle is about 50%.

The enable control pin, EN, is used for enabling the power supply. The logic threshold voltage is about 2V. When this pin is pulled down, the laser driver disables. There is a 12K pull-up resistor tied to a 5V power supply internally. Leaving this pin unconnected or driving it to above the 2V threshold voltage will enable the laser driver.

The LPGD pin indicates the laser drivers works properly under constant current mode when this pin is pulled high. It can be used for driving an LED directly and the maximum output current is 5mA.

### Caution

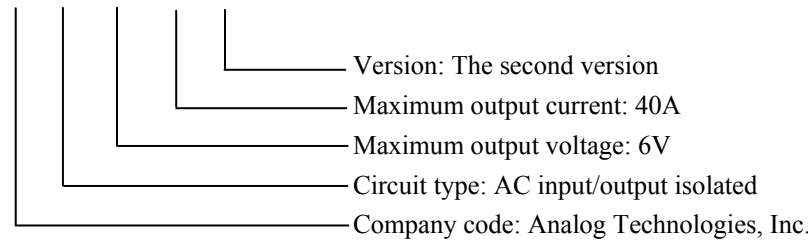
1. Please take the anti-static measures, such as wrist straps, when handling the module so as not to damage the module.
2. Always connect the module's AC input with a proper cable in series with a switch and a plug, do not use

stripped wires as the plug for connecting to the AC main socket. Make sure that the cable wires are firmly tighten by screw drivers onto the terminals to have reliable connections.

3. When making modifications on the connections, always turn off the power first.
4. Make sure that the polarity of the laser diode matches the polarity of the power supply's output.
5. Carefully and patiently check the application circuit. When you sure it is absolutely correct, you can turn on power supply. When the LED indicator light is lit up, it indicates that control loop is already stable.
6. To be on the safe side, we recommend using a dummy laser diode to replace the real laser diode first. The dummy diode can be composed of a serial of 2 to 3 regular high current diodes, such as 10A to 20A, and immerse the diodes into a cup of water. Use oscilloscope to look at the output waveform for checking the soft-start and soft-cut circuit. The output current can be measured by measuring the voltage across a low resistance value current sense resistor inserted into the circuit, and maximum output voltage can be measured by a volt meter by adjusting its value while keeping the output circuit open.

### NAMING

A AS 6V 40A 2



### ORDERING INFORMATION

Table 3. Part Number

Part #	Description
AAS6V40A2	High efficiency AC input laser driver, $I_{OUTMAX} = 40A$ , $V_{OUTMAX} = 6V$ , Pin 11 = 5V.
AAS6V40A2SN	High efficiency AC input laser driver, $I_{OUTMAX} = 40A$ , $V_{OUTMAX} = 6V$ , Pin 11 = SYNCO.

Table 4 Unit Price

Quantity	1 – 9	10 – 49	50 – 249	250 – 499	≥500
AAS6V40A2	\$228	\$216.6	\$205.2	\$193.8	\$182.4
AAS6V40A2SN					

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