# High Efficiency AC Input 40A 6V Laser Driver

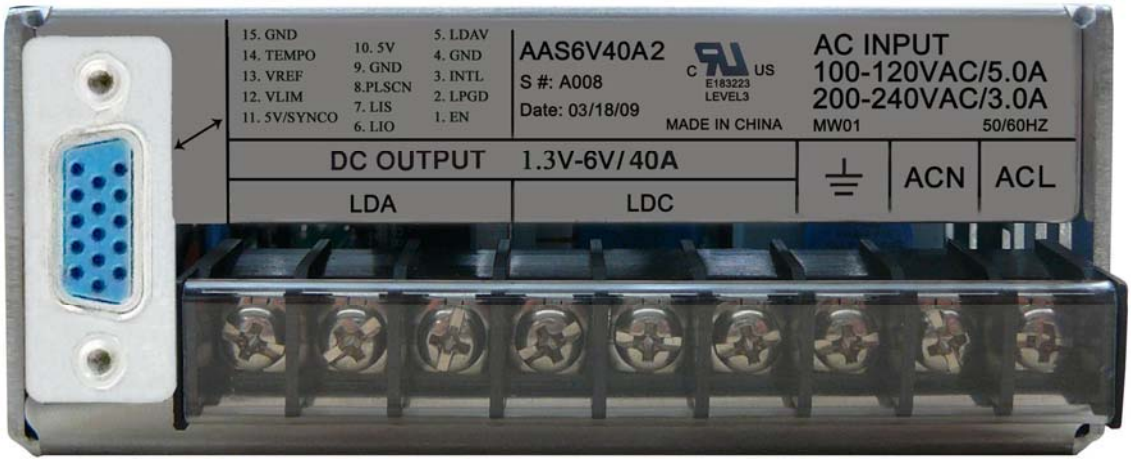


Figure 1. Front View Photo of the AAS6V40A2

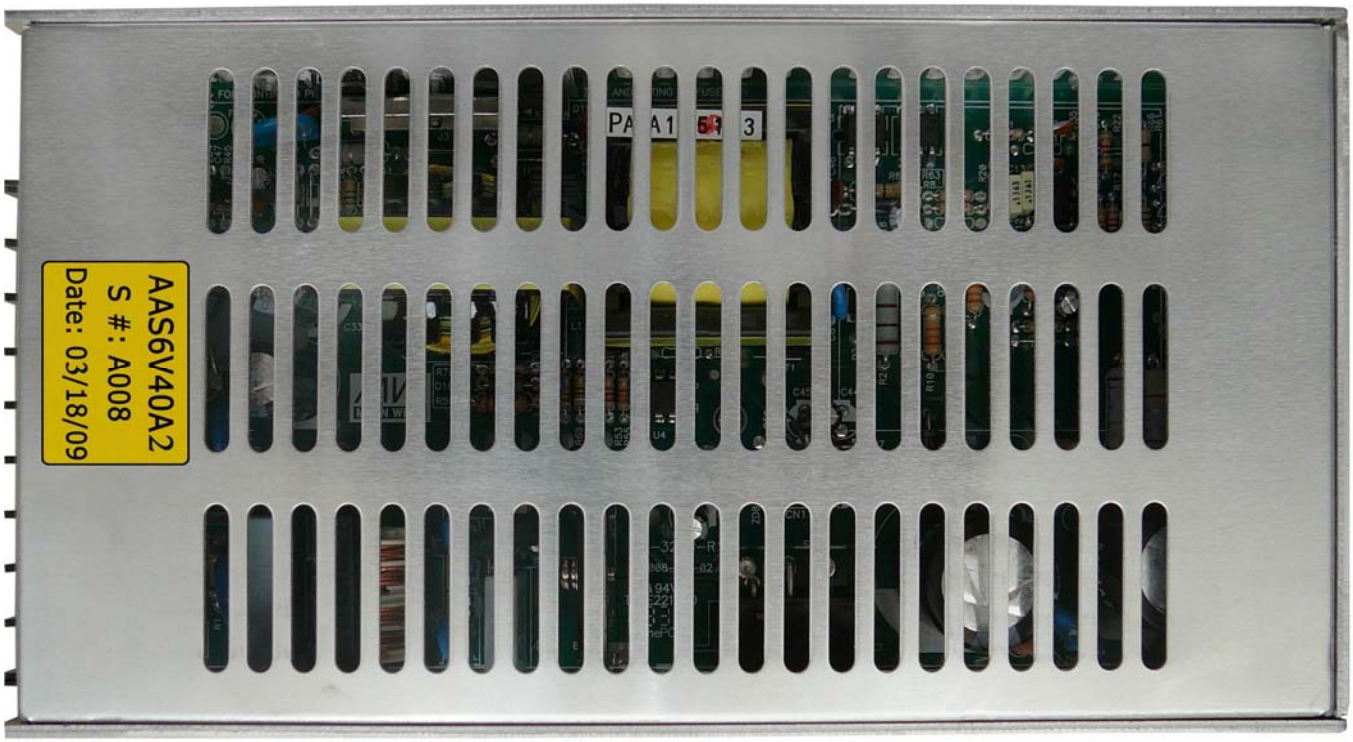


Figure 2. Top View Photo of the AAS6V40A2

## 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

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## 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.

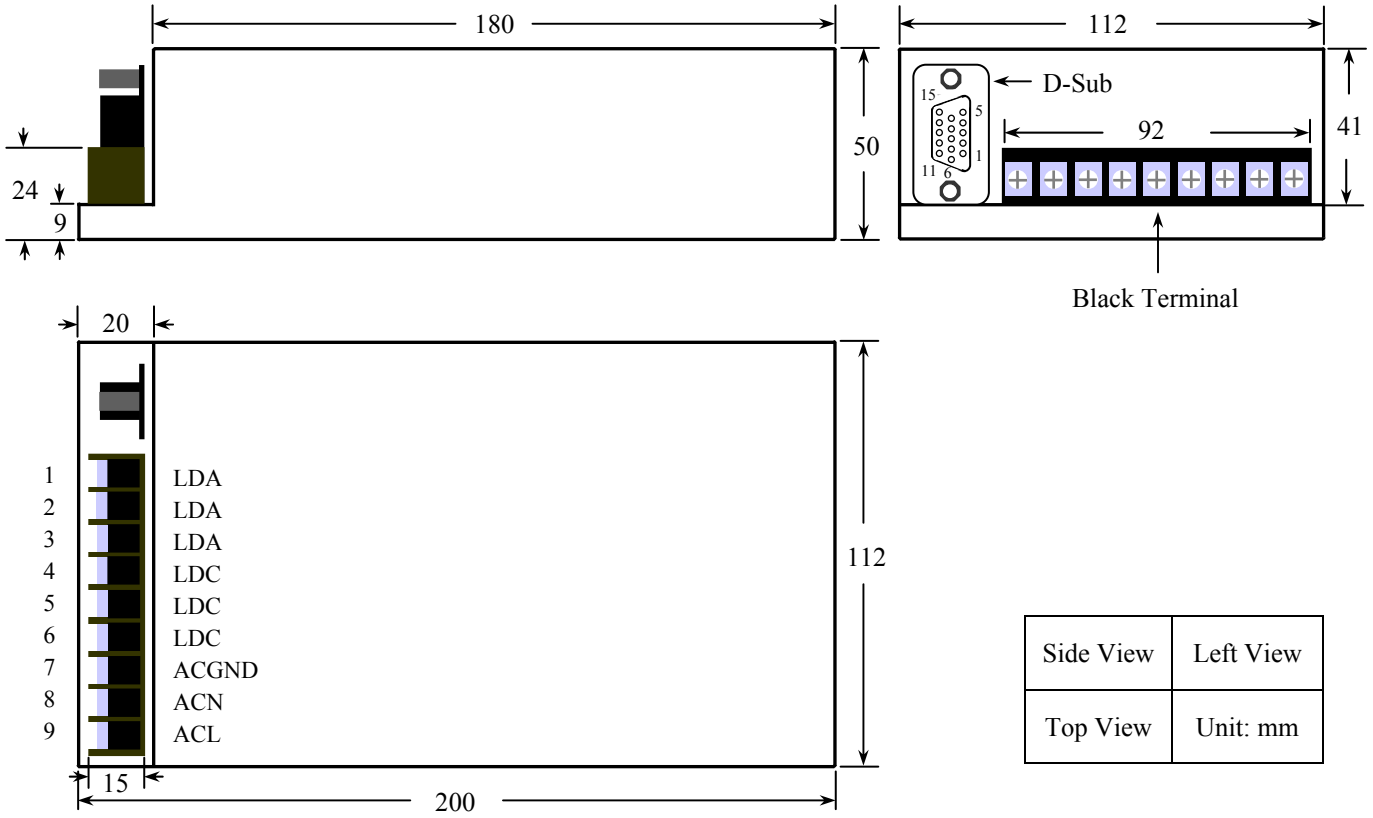
The control loop is monitored in real time by an internal circuit, to make sure that it works properly. The monitoring result is sent to the LPGD node. When this pin is pulled up internally, it indicates that the loop works fine.

## SPECIFICATIONS

Table 1. Characteristics ($T_A$ = 25°C)

| Parameter | Symbol | Test Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Efficiency | η | $V_{IN}$ = 110V AC, $V_{OUT}$ = 6V, $I_{OUT}$ = 40A | - | 86 | - | % |
| Output Current | $I_{OUT}$ | | 0 | Adjustable | 40 | A |
| Current Accuracy | $\triangle_I$ | –20°C ~ 50°C | - | ±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 | °C |

## MECHANICAL DIMENSIONS




| | |
|---|---|
| Side View | Left View |
| Top View | Unit: mm |

Figure 3. Pin Names and Locations

## TERMINAL DESCRIPTIONS

Table 2. Terminal Introduction

| # | | Name | Meaning | Type | Description |
|---|---|---|---|---|---|
| **Black terminal** | 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. |
| **D-Sub** | 1 | EN | Enable | Digital input | Internal 12K pull up resistor to 5V.<br>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.<br>Open = off, connect to GND = run. |
| | 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. |
| **D-Sub** | 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.

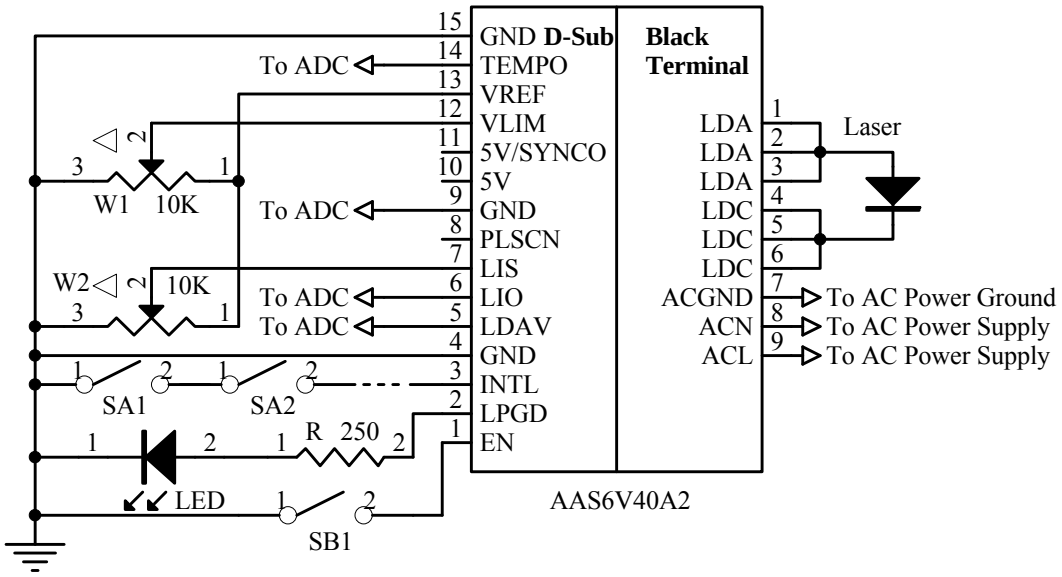



Figure 4. A Typical Application Schematic

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:

$V\_max = 2 \times VLIM + 1$ (V)

The output current formula is:

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

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

LIO pin indicates the output current:

Output current = 16 × LIO (A)

The module's temperature equation is:

Temperature = 72 × 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%.

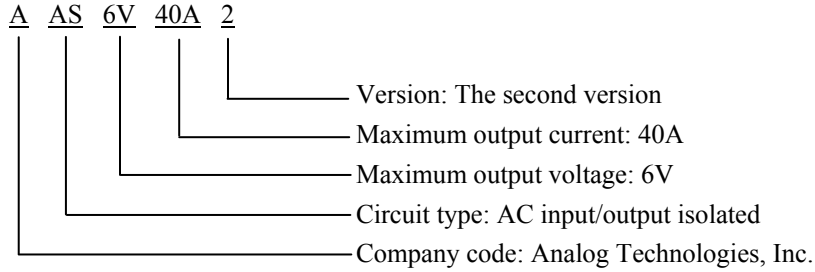
The enable control pin, EN, is used for enabling the power supply. The logic threshold voltage is about 2V. When this pin is pulled down, the laser driver disables. There is a 12K pull-up resistor tide to a 5V power supply internally. Leaving this pin unconnected or driving it to above the 2V threshold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




## 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**<br>**AAS6V40A2SN** | $228 | $216.6 | $205.2 | $193.8 | $182.4 |

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