

Constant Current LED Driver

General Description

VAS1086 is a wide input range constant current LED driver provides cost-effective solution for advertising light boxes, landscape lighting and other LED illumination applications. For most applications, VAS1086 only need one current setting resistor from SET to GND, and one ceramic bypass capacitor from VIN to GND, no aluminum capacitor, Schottky diode or inductor needed. For high current application, several VAS1086 can be connected in parallel to obtain high power output.

VAS1086 make use of an external power resistor connected from LED to SET to reduce chip power dissipation when poor power supply is used. Meanwhile, the VAS1086 will automatically reduce the output current when the die temperature reached 120°C, this method avoid LED bar blinking. Over temperature protection is also be integrated.

VAS1086 is available with SOP8-e package.

Ordering Information

Order Number	Package Type	Temp. Range
VAS1086ID08E	SOP8-e	-40 °C to 85°C

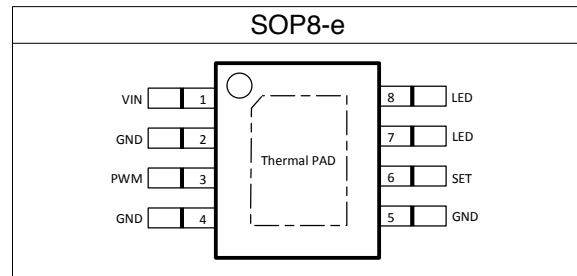
Features

- Wide input range from 2.7 to 40V
- Simple application circuits
- Temperature Compensation and Over-Temperature-Protection function
- $\pm 3\%$ SET voltage accuracy
- Obtain larger output current by in parallel
- SOP8-e package

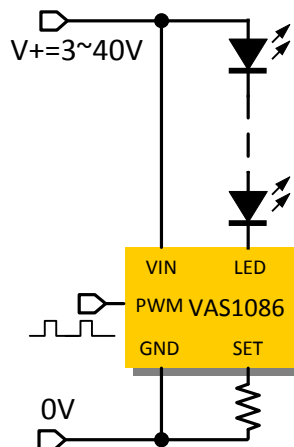
Application

- Advertising light boxes
- Landscape lighting
- The current sense
- Ideal current source

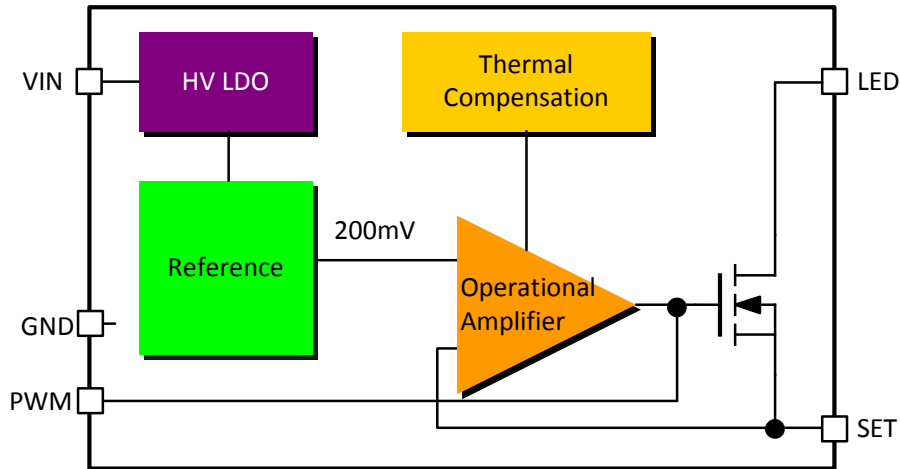
Pin Configuration



Typical Application Circuit



Block Diagram



PIN Description

PIN-OUT	Name	Description
1	VIN	Power Supply Input, do not over 40V.
2, 4, 5	GND	Ground
3	PWM	PWM Dimming Control
6	SET	Current setting pin, connect an external resistor ground to set LED current
7, 8	LED	Connect to LED cathode
EP	GND	Exposed Pad. Connect to a large-area ground plane for improved power dissipation. Do not use as the only ground connection for the device.

Absolute Maximum Ratings (Note1)

Parameters	Maximum Ratings
VIN, PWM, LED to GND	-0.3V to 44V
SET	-0.3V to 6V
Operating temperature range	-40°C to +85°C
Junction temperature	-40°C to +150°C
Storage temperature range	-65°C to +150°C
ESD human body model	±2000V

Note 1: Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Operating Ratings indicate conditions for which the device is functional, but do not guarantee specific performance limits. Electrical Characteristics state DC and AC electrical specifications under particular test conditions which guarantee specific performance limits. This assumes that the device is within the Operating Ratings. Specifications are not guaranteed for parameters where no limit is given, however, the typical value is a good indication of device performance.

Electrical Characteristics

Test Condition(note 2): VIN=12V, TA=25°C (unless otherwise specified)

Symbol	Parameter	Test Condition	SPEC			Unit
			Min.	Typ.	Max.	
VCC	Input voltage range		2.7		40	V
ICC	Quiescent current	No load		200		uA
V _{ISET}	ISET pin voltage			200		mV
I _{ACCU}	LED current accuracy	V _{LED} =0.5V		±3		%
V _{HR-LED}	Minimum head-rom voltage to maintain LED current	R _{SET} =2Ω, I _{LED} =100mA			0.55	V
R _{DSON}	The conduct resistor between LED to ISET pin				0.6	Ω
T _{SD}	Over temperature protection threshold			160		°C
R _{θJA}	Thermal resistance	DFN-6L		50		°C/W

Note 2: Production testing of the device is performed at 25°C. Functional operation of the device and parameters specified over other temperature range, are guaranteed by design, characterization and process control.

Application Information

1. Set LED Current

The VAS1086 feature a programmable LED current using a resistor connected between SET and ground. Use the following equation to calculate the sense resistor:

$$I_{LED} = \frac{0.2V}{R_{SET}}$$

Change the value of RSET can obtain the required constant current. The chip power consumption is $I_{LED} * V_D$, V_D is LED cathode voltage.

In order to get the higher accuracy of the LED output current ,an 1% or more high precision resistor is commented. If the environment temperature changes a lot, such as change in -25°C to 85°C, use the low temperature coefficient resistance to ensure that the resistance value is almost constant.

2. Over-Heating Issue

As the LED power supply rises, the LED cathode voltage will follow up, this will cause the chip overheating. The VAS1086 solve the issue by:

1) If the VAS1086 die temperature rise to 120 °C (IC surface temperature is about 80°C), LED current started to decrease gradually, as the temperature reach 160°C, LED current dropped by half.

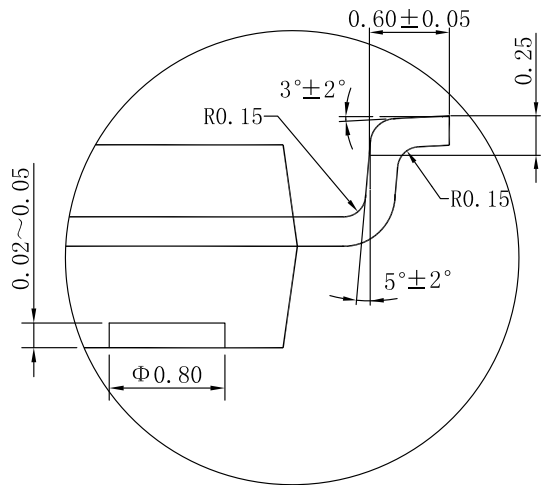
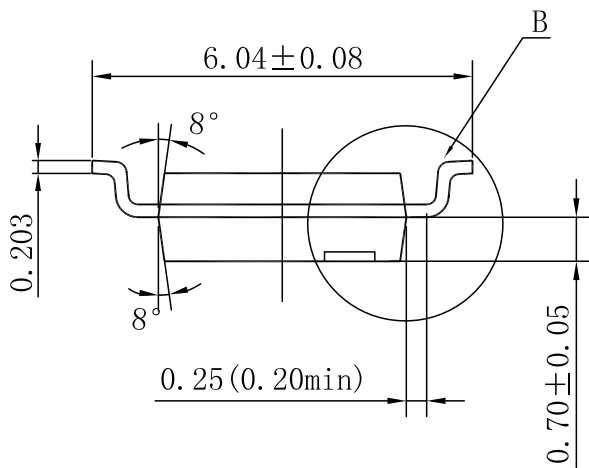
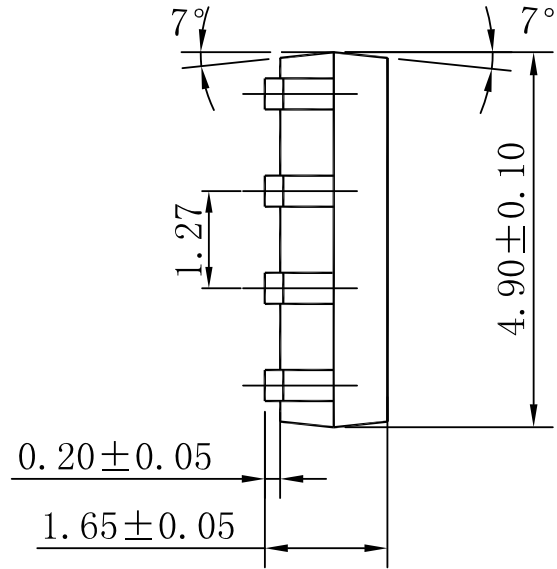
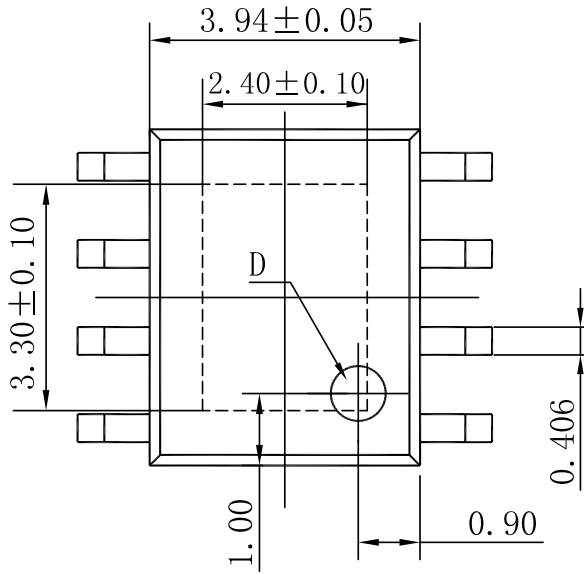
2) If the temperature continues to increase to 160°C, VAS1086 enter thermal shutdown mode. When the temperature dropped to 120°C, VAS1086 re-start to work again.

3. PCB Layout

Careful PCB layout is critical to achieve low switching losses and stable operation. Connect a 0.1μF ceramic capacitor between VIN and ground for better noise immunity. The SET pin is a high impedance pin, do not parallel with any capacitor. Minimize the SET pin ground noise by connecting a ground as wide and short as possible. Guard Ring and the similar potential signal (such as GND) line to the surround can prevent RSET interfered .



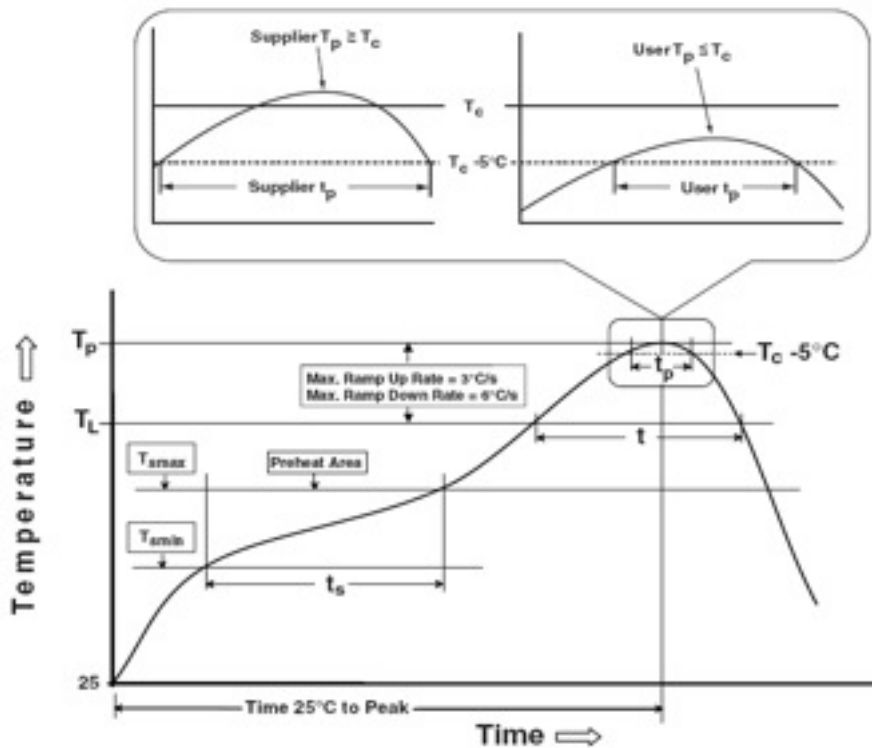
Package Information (SOP8-e)





Classification Reflow Profiles

Profile Feature	Pb-Free Assembly
Preheat & Soak Temperature min (T _{smin}) Temperature max (T _{smax})	150°C 200°C
Time (T _{smin} to T _{smax}) (t _s)	60-120 seconds
Average ramp-up rate (T _{smax} to T _p)	3°C/second max.
Liquidous temperature (T _L) Time at liquidous (t _L)	217°C 60-150 seconds
Peak package body temperature (T _p)*	Max 260°C
Time (t _p)** within 5°C of the specified classification temperature (T _c)	Max 30 seconds
Average ramp-down rate (T _p to T _{smax})	6°C/second max.
Time 25°C to peak temperature	8 minutes max.



Classification Profile

 **CAUTION**

Storage Conditions

- 1) This product should be used within 12 months after delivered. Store in manufacturer's package keeping the seal of aluminum coated baggage or tightly re-closed box with the following conditions.
[Temperature:8°C...30°C, Humidity:30%...70% R.H.]
- 2) Keep the seal of aluminum coated baggage immediately before usage.
- 3) After breaking the seal of aluminum coated baggage, this product should be used within 1 week on the following conditions.
[Temperature:≤30°C, Humidity: ≤60% R.H.]