



5~150mA Programmable Constant Current Regulator

General Description

VAS1085 is a wide input range constant current LED driver to provide cost-effective solution for advertising light boxes, landscape lighting and other LED illumination application. For common application, VAS1085 needs only one external resistor to set the LED current. For high current application, several VAS1085 can be connected in parallel to deliver higher output power.

VAS1085 can achieve 85% full setting current with only 1.35V input voltage, with this feature, it is ideal for applications with extremely low power supply voltage. Integrated over temperature protection, the LED current will automatically reduce when the die temperature reaches 140 °C, and shut down when the die temperature reaches 160 °C.

VAS1085 is available with SOT23-5 package.

Application

- Advertising light boxes
- Landscape lighting
- The low side current sink
- Ideal constant current source

Features

- Wide supply range from 1.2V to 40 V
- Simple application circuits
- Up to 150mA output current capability
- Obtain larger output current in parallel
- $\pm 5\%$ SET voltage accuracy
- Support PWM dimming
- Over-Temperature-Protection
- SOT23-5 package

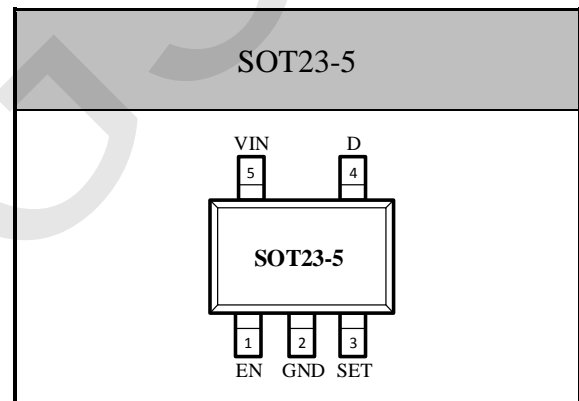
Ordering Information

Order Number	Package Type	Temp. Range
VAS1085IC05E	SOT23-5	-40 °C to 85 °C

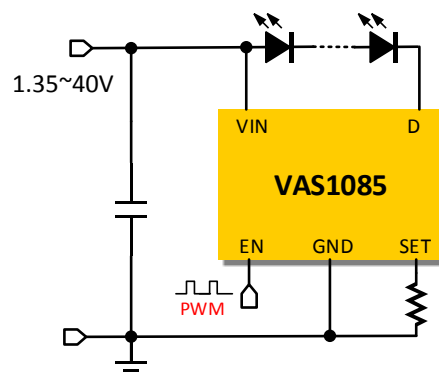
I: Industry, -40~85 °C
05 : Pin Number

C: SOT23
E: ROHS

Pin Configuration

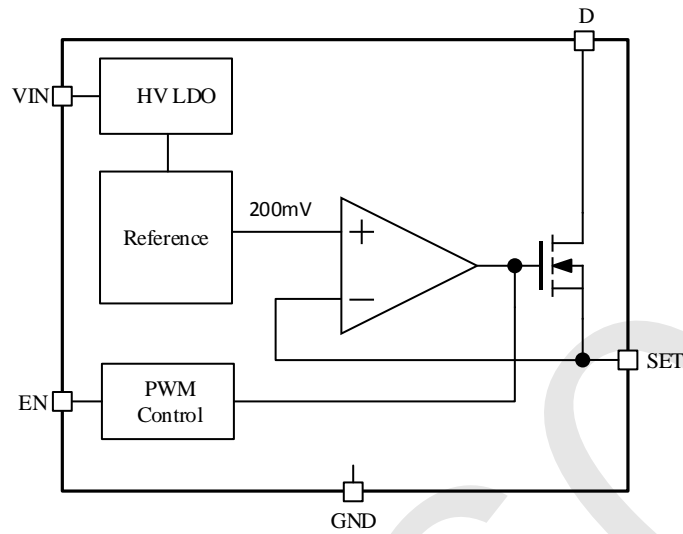


Typical Application Circuit





Block Diagram



PIN Description

PIN NO.	Name	Description
1	EN	This pin has 2 functions: 1) Active High Enable 2) PWM dimming input
2	GND	Ground
3	SET	Current setting pin, connect an external resistor to ground $I_{LED} = 200mV / R_{SET}$
4	D	Connect to LED cathode
5	VIN	Power Supply Input



Absolute Maximum Ratings^(Note1)

Parameters	Maximum Ratings
VIN, D, EN to GND	-0.3V to 44V
SET to GND	-0.3V to 8V
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^(Note2): VIN=5V, TA=25 °C (unless otherwise specified)

Symbol	Parameter	Condition	SPEC			Unit
			Min	Typ	Max	
VIN	Input Voltage				40	V
V _{START_UP}	Vin start up voltage	I _{LED} =85% * I _{SET} , I _{SET} =30mA		1.35	1.65	V
I _{CC}	Quiescent current	SET floating		200	500	uA
I _{SD}	Shutdown quiescent current	EN connect to Low voltage		20		uA
V _{SET}	SET pin voltage	I _{SET} =30mA	190	200	210	mV
I _{ACCU}	LED current accuracy			±5		%
V _{THH_EN}	EN pin enable voltage		1.4			V
V _{THL_EN}	EN pin disable voltage				0.4	V
V _{HR-D}	Minimum D pin voltage to maintain LED current	R _{SET} =2Ω, I _{LED} =100mA		0.4		V
R _{DSON}	The conduct resistor between D to SET pin	R _{SET} =2Ω, I _{LED} =100mA		2		Ω
T _{SD}	Over temperature protection threshold, the chip will shut down.			160		°C
T _{HYS}	Over temperature protection hysteresis			30		°C

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.



Typical Performance Curves

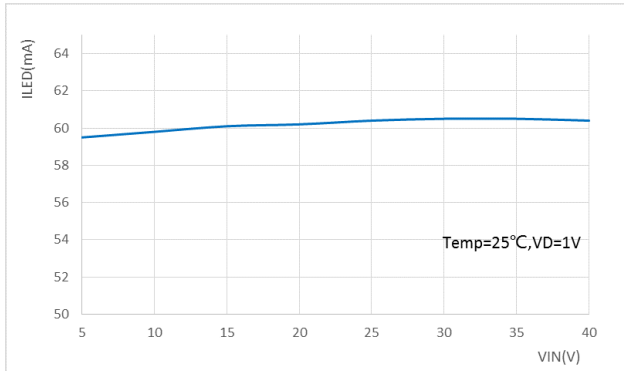


Fig.1 LED Current vs. Vin

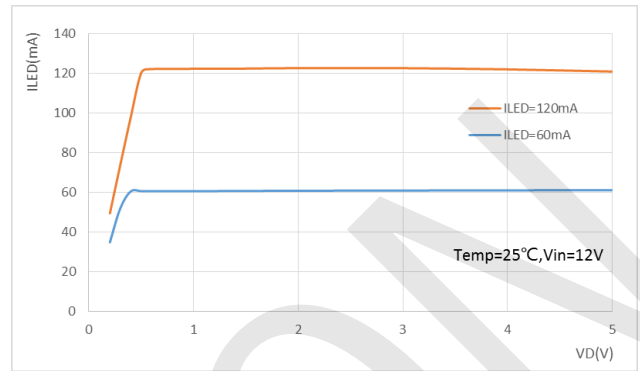


Fig.2 LED Current vs. VD

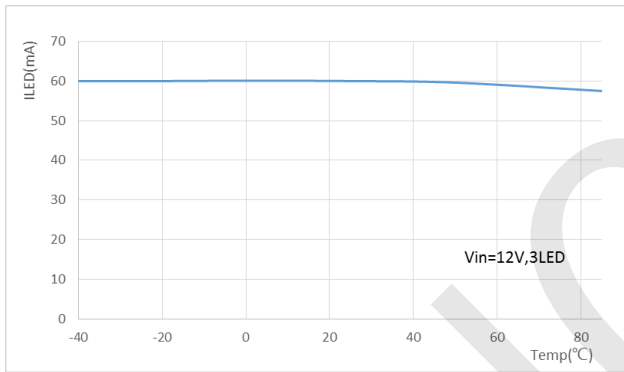


Fig.3 LED Current vs. Temp

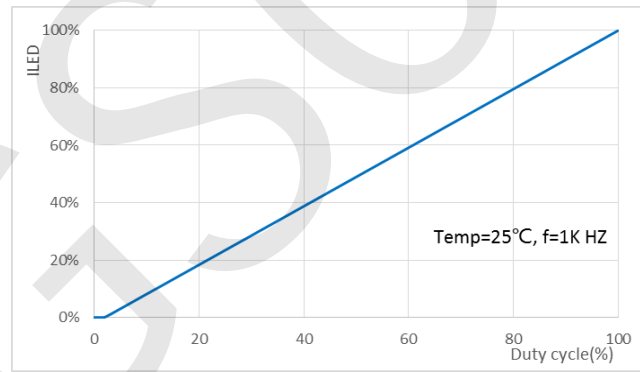


Fig.4 LED Current vs. PWM Duty Cycle



Application Information

It is highly recommended to add a 0.1uF ceramic capacitor from VIN to GND to suppress high frequency noise.

1. Set the LED Current

The VAS1085 featured a programmable LED current using a resistor connected between SET and GND. The LED current can be calculated by:

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

Change the value of R_{SET} 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, a 1% or more high precision resistor is commented. If the environment temperature changes a lot, use low temperature coefficient resistance to ensure that the resistance value is almost constant.

2. PWM Dimming

EN pin can be used for PWM dimming, frequency range is 60Hz~10 KHz, the LED average current is proportional to PWM duty cycle. Connect EN pin to High Voltage for 100% brightness. And EN pin can be floating for 100% brightness.

3. Over-Heating Issue

As the LED power supply rises, the LED cathode voltage will follow up, this will cause the chip overheating. The VAS1085 solve the issue by:

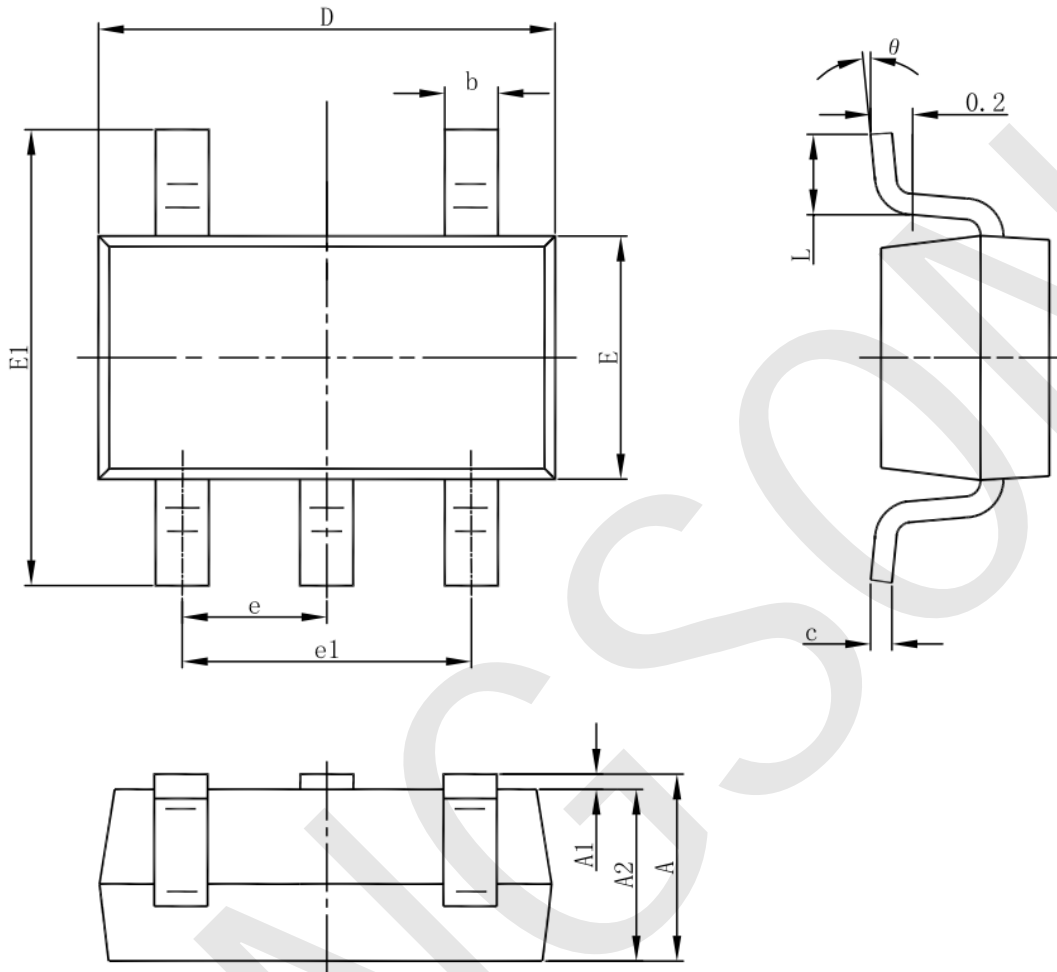
- 1)If the VAS1085 die temperature rises to 140 °C, LED current will automatically reduce;
- 2)If the temperature continues to increase to 160 °C, VAS1085 enter thermal shutdown mode.

When the temperature dropped to 130 °C, VAS1085 re-start to work again enter stage1 mode.

4. PCB Layout

Careful PCB layout is critical to achieve stable operation. 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.

Package Information (SOT23-5)



SYMBOL	Dimension In Millimeters		Dimension In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950 (BSC)		0.037 (BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°