

## TRIAC Dimmable LED Driver

### Description

VAS1512C is a current mode PFM AC/DC boost converter with integrated 700V MOSFET. The device can keep output current constant by setting an external resistor. It can provide up to 15W output, and is ideal for all kinds of LED lighting applications.

VAS1512C can be powered by the AC mains directly, and it can keep the output current constant even when the input voltage fluctuates in a large range.

VAS1512C is available in a SOP8-e package.

### Features

- Up to 15W Output
- Integrated 700V MOSFET
- Up to 90% Efficiency
- $PF > 0.9$
- Flickerless
- Over Temperature Protection

### Applications

- LED Bulbs
- G9/GU10/MR16
- LED Filament Bulbs

### Ordering Information

Order Number	Package Type	Temp. Range
VAS1512CID08E	SOP8-e	-40 °C to 105 °C

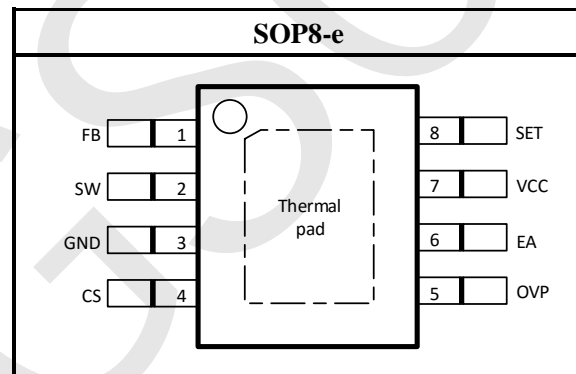
I: Industry, -40~85 °C

D: SOP

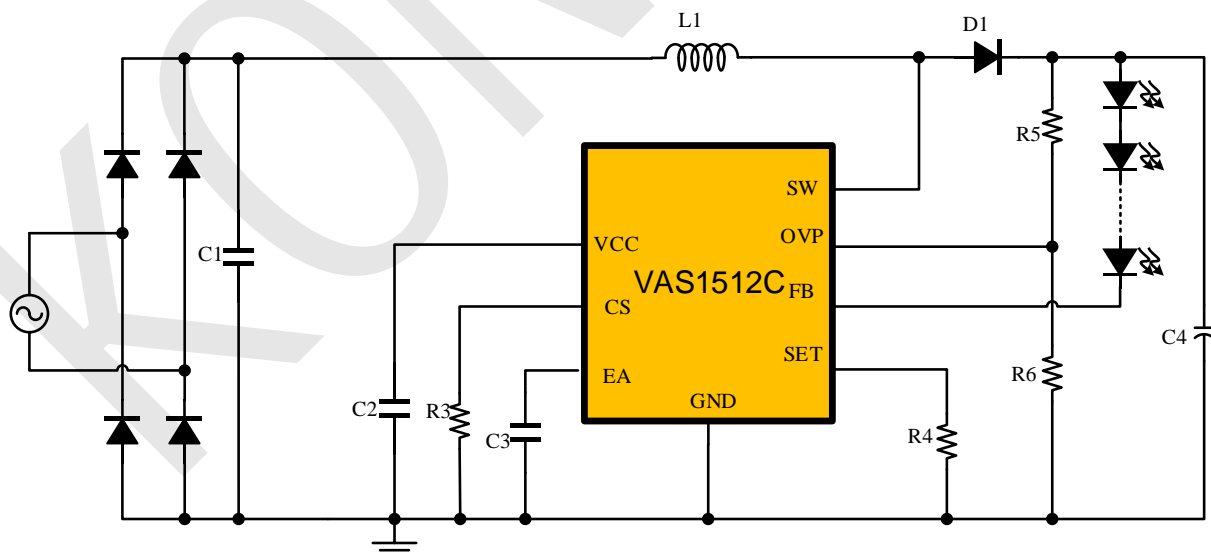
08: Pin Number

E: ROHS

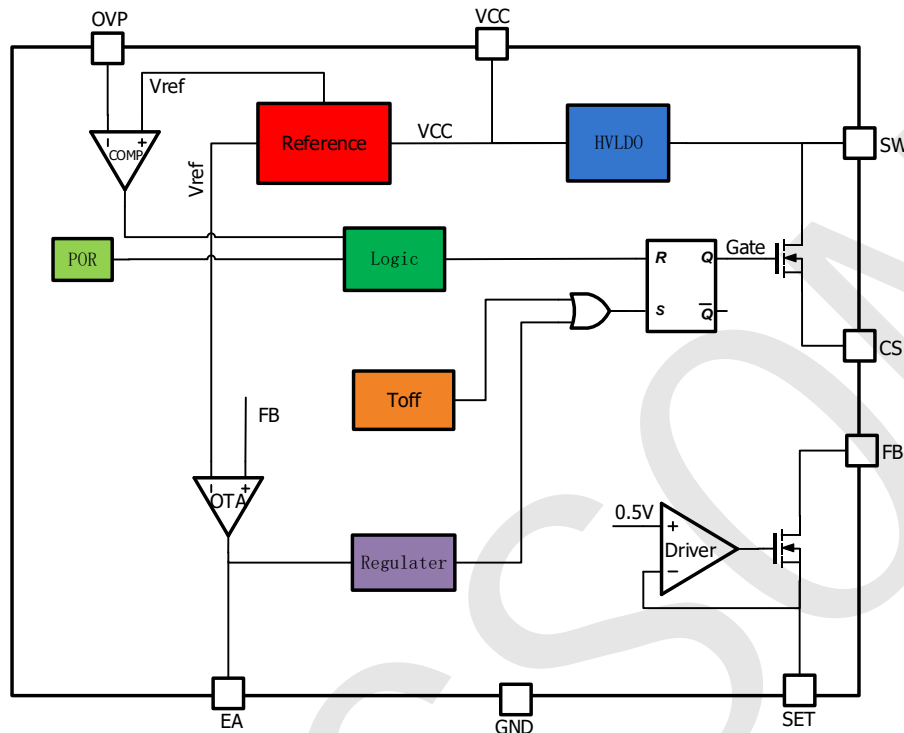
### Pin Configuration



### Typical Application Circuit



## Block Diagram



## Pin Description

PIN NO.	Name	Description
1	FB	Output voltage feedback pin
2	SW	Switching pin. Connect a inductance to the input
3	GND	Ground
4	CS	The input peak current sense pin, $I_{peak} = \frac{V_{CSTH}}{R_{cs}}$ , $V_{CSTH}=0.3V$
5	OVP	Over voltage protection detecting pin, LED open circuit protection
6	EA	Output of error amplifier, connect a capacitor for loop compensation
7	VCC	Internal power supply of the device. Typically the constant voltage of this pin is 18V
8	SET	Connecting a resistor to GND to set the LED current, $I_{LED} = \frac{V_{SET}}{R_{SET}}$ , $V_{SET}=500mV$ .



### Absolute Maximum Ratings (Note1)

Parameters	Maximum Ratings
SW to GND	-0.3V to 700V
FB to GND	-0.3V to 500V
VCC to GND	-0.3V to 25V
SET、OVP、EA、CS to GND	-0.3V to 8V
Junction temperature	-40 °C to +150 °C
Storage temperature range	-65 °C to +150 °C
ESD human body model	2000V

Note1: Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other condition beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

### Electrical Characteristics (Note2)

Symbol	Parameter	Condition	SPEC			Unit
			Min.	Typ.	Max.	
VSUP	Input voltage range				500	V
I <sub>CC</sub>	Quiescent current	V <sub>ac</sub> =220V		300	1000	μA
V <sub>CSTH</sub>	Input peak current threshold			0.3		V
V <sub>SET</sub>	SET pin voltage		0.485	0.5	0.515	V
I <sub>ACCU</sub>	Current accuracy	V <sub>ac</sub> =220V		±5		%
V <sub>OVP</sub>	OVP threshold		1.23	1.3	1.36	V
V <sub>FB</sub>	Minimum feedback voltage to hold LED current constant	I <sub>LED</sub> =30mA		5		V
T <sub>SD</sub>	OTP threshold			160		°C
R <sub>ΘJA</sub>	Thermal resistance	SOP8-e		60		°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.



## Functional Description

VAS1512C fulfills a boost architecture with only a few extra components and achieves excellent line-regulation and TRIAC dimming performance. Refer to the block diagram and typical application circuit for the following discussing. All the parameters mentioned below are typical values.

### 1. Start-up

Once the system is power-on, VAS1512C draws a current from the SW to charge the VCC cap. Internal LDO block takes over and clamps VCC voltage at 18V, served as the power supply for internal circuits and keeps the system in normal operation.

### 2. Output/LED Current Setting

The device is used in a LED driver application with constant output current. Cathode of the LED series is connected to the FB PIN so that the current may flow throughout the device to the SET PIN, which acted as a current source. The LED typical current can be calculated by the equation:

$$I_{LED} = \frac{V_{SET}}{R_{SET}}$$

And the relationship of system input power vs. LED current may be described as the given empirical formula:

$$P * \eta = I_{LED} * (V_{LED} + 7)$$

Where  $\eta$  is the efficiency of the system, and  $V_{LED}$  is the voltage of the LED string, and assuming that average FB voltage is 7V.

The IC integrates a 500V power MOS in the FB PIN thus enhancing its high voltage tolerance and safety.

### 3. Power MOSFET Peak Current Setting

VAS1512C is a boost converter and the input peak current is the most significant parameter for the system. The peak current is sensed by CS PIN and can be calculated by the equation:

$$I_{peak} = \frac{V_{CS}}{R_{CS}}$$

### 4. Output Regulation and Off-time control

VAS1512C operates in PFM mode and employs a unique feedback loop to keep the output current constant though the line voltage varies in a large scale.

A boost converter's conversion ratio (continuity mode) is defined by:

$$\frac{V_o}{V_{in}} = \frac{T_{on} + T_{off}}{T_{off}}$$

Since the device operates in constant peak current mode,  $T_{on}$  (MOSFET turn on time) is determined by the line voltage and inductance while the  $R_{CS}$  is setup and given. Therefore,  $T_{off}$  (MOSFET turn-off time) is the only factor that we can manufacture to maintain output constant against line voltage varies. An error amplifier is used along with the EA capacitor to adjust turn-off time according to VIN.



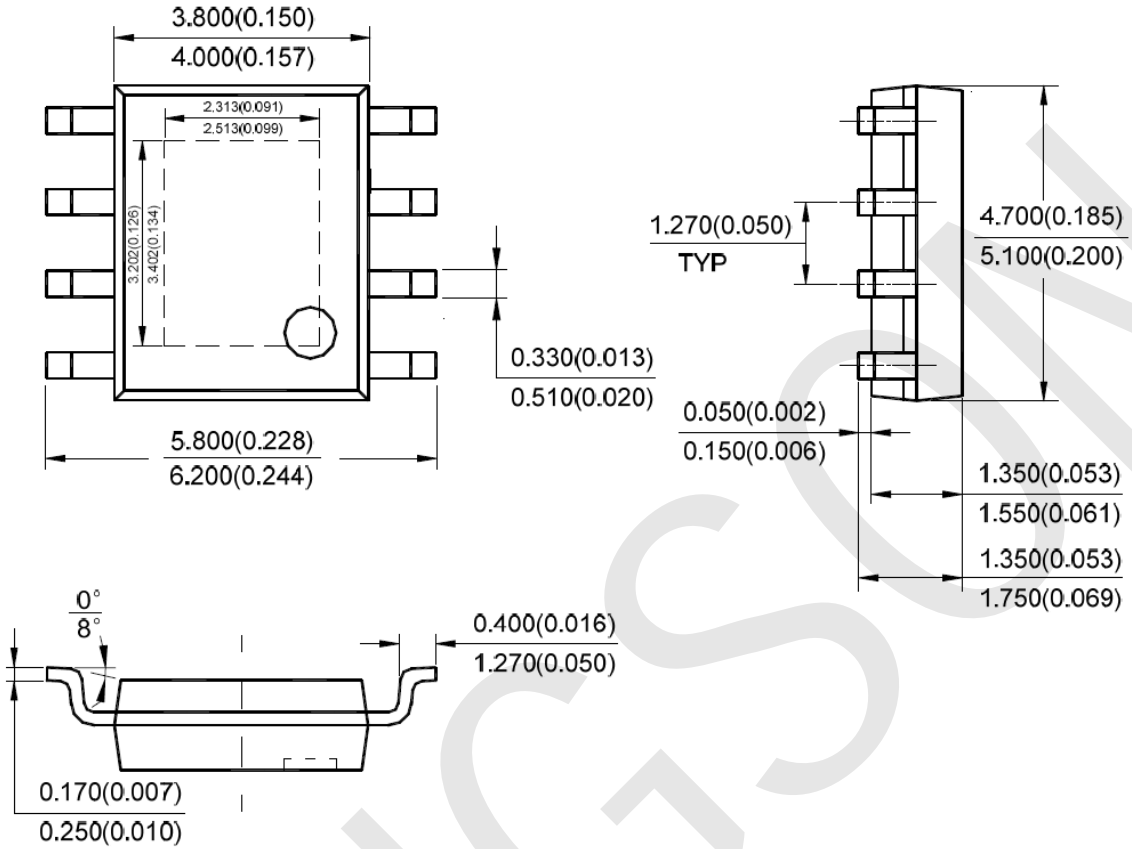
### 5. Over Voltage Protection and Thermal Protection

VAS1512C integrates multiple protection to ensure safety of the system. When the voltage at OVP PIN exceeds 1.3V, it probably means that the output voltage is too high or the LED series is open, thus the internal MOSFET will be turned off until the OVP voltage drops to 0.8V. Additionally, if the temperature rises up to 160 °C, the device will shut down. And it will resume to normal operation when the temperature drops to 130 °C.

KONGSON



Package Information (SOP8-e)





## ⚠ 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 ℃...30 ℃,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℃, Humidity: ≤60% R.H.]