SY5864

Adaptive LED Current Filter For LED Lighting

General Description

The SY5864 is an adaptive linear current regulator to eliminate low frequency current ripple targeting at LED lighting applications.

It is applied as a current filter to the output of a LED driver, especially single stage LED driver. It adopts adaptive control scheme and no additional electrical design is needed.

Reliable open/short LED protection and over thermal protection are all provided.

Features

- Current filter for single stage LED driver to eliminate current ripple
- Proprietary scheme for low power loss ≤2.5%
- Adaptive for wide output speculation:
  Output voltage range from 20V to 60V
  Output current range from 0.5A to 1.5A
- Open LED Protection and Short LED protection
- Reliable short LED and Open LED protection
- RoHS Compliant and Halogen Free
- Compact package: TO220-3

Ordering Information

SY5864 □(□□)□

- Temperature Code
- Package Code
- Optional Spec Code

Ordering Number	Package type	Note
SY5864KAC	TO220-3	----

Applications

- LED lighting

Typical Applications

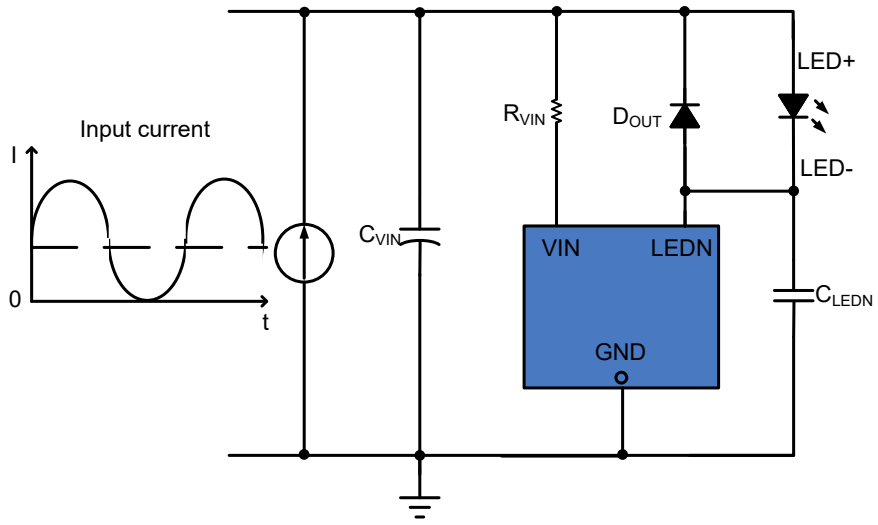

Figure 1. Schematic Diagram

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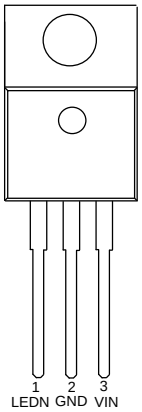
Pinout (top view)



(TO220-3)

Top Mark: AZGxyz (device code: **AZG**, ***x=year code, y=week code, z= lot number code*****)**

Pin Name	Pin Description
LEDN	Cathode of LED string.
VIN	Power Supply
GND	Ground pin

Block Diagram

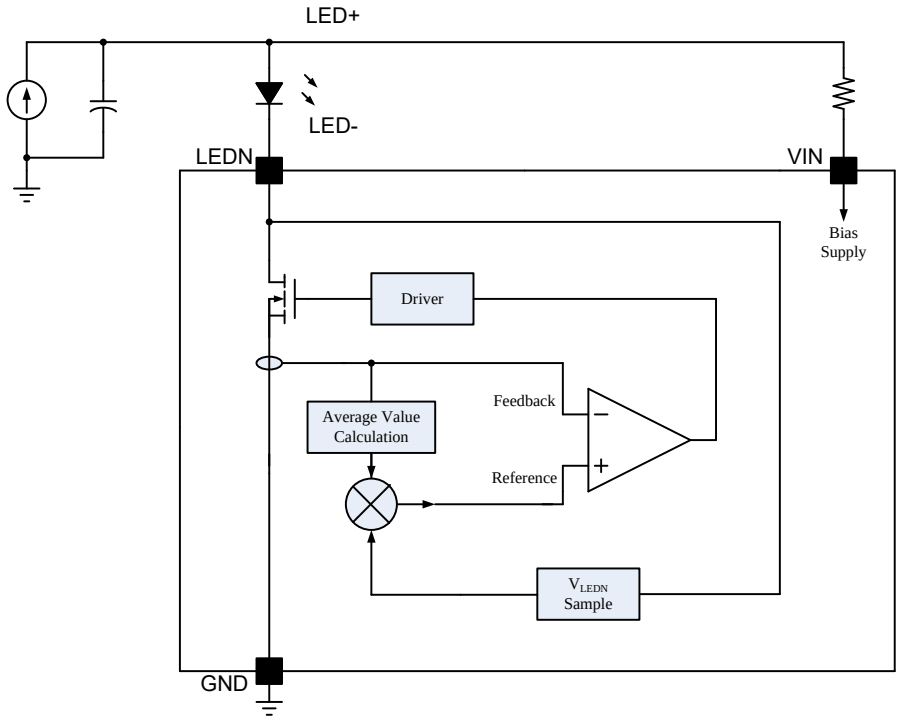


Fig. 2. Block diagram

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Absolute Maximum Ratings (Note 1)

VIN ---------- -0.3V~60V
LEDN ---------- -0.3~60V
Power Dissipation, @ T_A = 25°C TO220-3---------- 5W
Package Thermal Resistance (Note 2)
TO220-3, θ_{JA} ---------- 62.5°C/W
TO220-3, θ_{JC} (Note 3)---------- 1°C/W
Junction Temperature Range ---------- -40°C to 150°C
Lead Temperature (Soldering, 10 sec.) ---------- 260°C
Storage Temperature Range ---------- -65°C to 150°C

Recommended Operating Conditions

VIN, LEDN ---------- 20V~60V

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Electrical Characteristics

(V_{IN} = 12V, T_A = 25°C unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Power Supply Section						
VIN turn-on threshold	V_{VIN_ON}		2.9	3.4	4.1	V
VIN turn-off threshold	V_{VIN_OFF}		2.7	3.2	3.9	V
VIN operating current	I_{VIN}		70	91	120	μA
LEDN section						
High Voltage Protection	V_{LEDN_HV}		4.3	4.85	5.3	V
Over Voltage Protection	V_{LEDN_OV}		12.3	14	15.7	V
Thermal Section						
Thermal Shutdown Temperature	T_{SD1}	$V_{LEDN} < V_{LEDN_OV}$		150		°C
Thermal Shutdown Temperature	T_{SD2}	$V_{LEDN} > V_{LEDN_OV}$		100		°C
Thermal Hysteresis	T_{HYS}			20		°C

Note 1: Stresses beyond the "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only. Functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Note 2: Θ_{JA} is measured according to JESD 51-2 and JESD51-7.

Note 3: Case refers the bottom of the chip, which would be connected to heatsink.

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General Applications

The SY5864 is an adaptive linear current regulator to eliminate low frequency current ripple targeting at LED lighting applications.

It is applied as a current filter to the output of a LED driver, especially single stage LED driver. It adopts adaptive control scheme and no additional electrical design is needed.

It is adaptive for wide output speculation, the output voltage is ranging from 20V to 60V; the maximum output current is 1.5A. It adopts proprietary scheme for low power loss and the efficiency loss is no more than 2.5%. It also can be operated in parallel to support higher LED current.

SY5864 provides reliable protections such as Short LED Protection (SLP), Open LED Protection (OLP), and Over Temperature Protection (OTP).

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SY5864 is available with TO220-3

Start up

When V_{VIN} rises up over V_{VIN_ON}, internal blocks start to work. At first, it has certain blanking time without current filter function to build up stable average current reference internally. Then the LED current ripple is suppressed gradually.

Shut down

When V_{VIN} drops down below V_{VIN_OFF}, LEDN Pin is changed to high impedance to GND Pin.

Steady state

LED current is sampled and processed inside the IC. The average value of LED current is taken as the reference to regulate the instantaneous current. At the same time, V_{LEDN} is sensed and kept low to avoid high power loss on the IC.

If the input/output has certain dynamic turbulence, V_{LEDN} might be higher than V_{LEDN_HV}, then LED current ripple suppression will be loosen to make V_{LEDN} drop down quickly until V_{LEDN} is lower than V_{LEDN_HV}. Hence, the normal value of V_{LEDN} must be lower than V_{LEDN_HV}.

Open LED & Recover

When LED is open, LED current and V_{LEDN} both drop to zero naturally, the IC will quit the current filter function.

When LED is recovered, LED current is sensed and IC acts just like start up again.

Short LED & Recover

When LED is short, V_{LEDN} is pulled up high. If V_{LEDN} is higher than V_{LEDN_OV}, LED current will be limited at certain value and thermal shut down threshold is changed down to T_{SD2}.

When LED is recovered, V_{LEDN} is pulled down. If V_{LEDN} is lower than V_{LEDN_OV}, LED current limit is removed and thermal shut down threshold is changed back to T_{SD1}.

When LED is short, the external diode D_{OUT} is used to avoid LEDN overshoot which is caused by parasitic inductance of output wire.

Safety Test

The external R_{VIN} and C_{LEDN} are used to protect VIN/LEDN pin from overvoltage, especially in the ESD Test and Hipot Test, recommend R_{VIN}=20KΩ and C_{LEDN}= 100nF.

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Parallel operation application

SY5864 can be operated in parallel to support higher LED current. The circuit is shown in below.

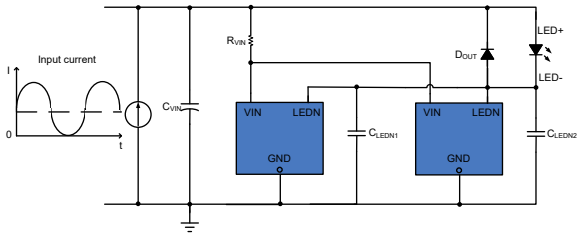

Fig3. Parallel circuit

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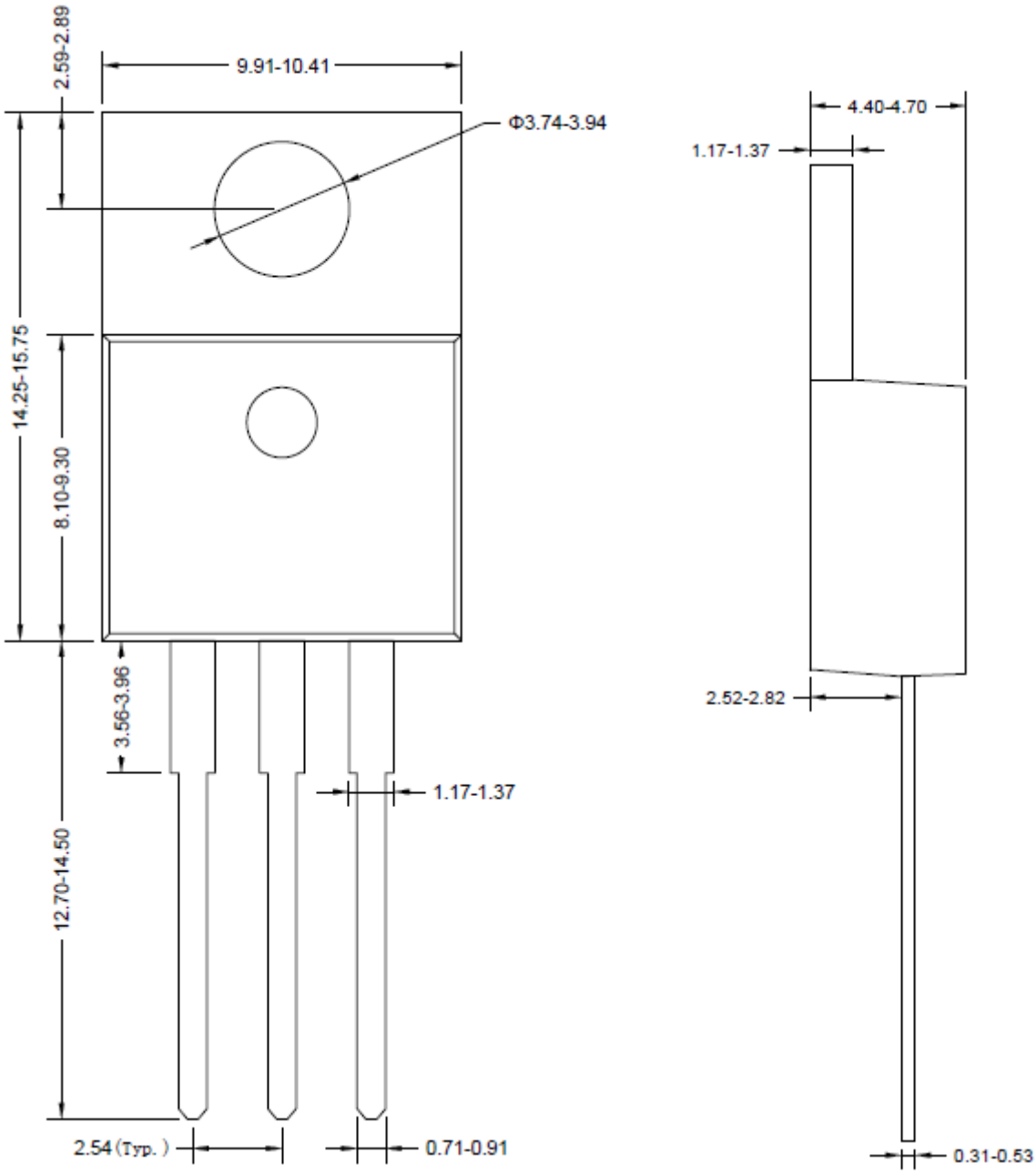
TO220-3 Package Outline



Top view **Side view**

Notes: All dimension in millimeter and exclude mold flash & metal burr

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