

Dimmable Off-Line Linear LED Driver

FEATURES

- Constant Current Regulator
- Compatible with TRIAC Dimmer
- Wide Range, Programmable LED Voltage
- Output LED Peak Current available from 50mA to 100mA
- Can be Paralleled for Higher Current
- 5V to 500V Supply Voltage Range
- High Efficiency
- Stable LED Brightness
- Over Temperature Protection
- SOP-8 Exposed pad Package
- Patent Pending Drive Architecture.

APPLICATIONS

- LED Lamps (e.g. E27, GU10)
- General Illumination
- LED Strings (e.g. T-8 Tube)
- Constant Current Sink

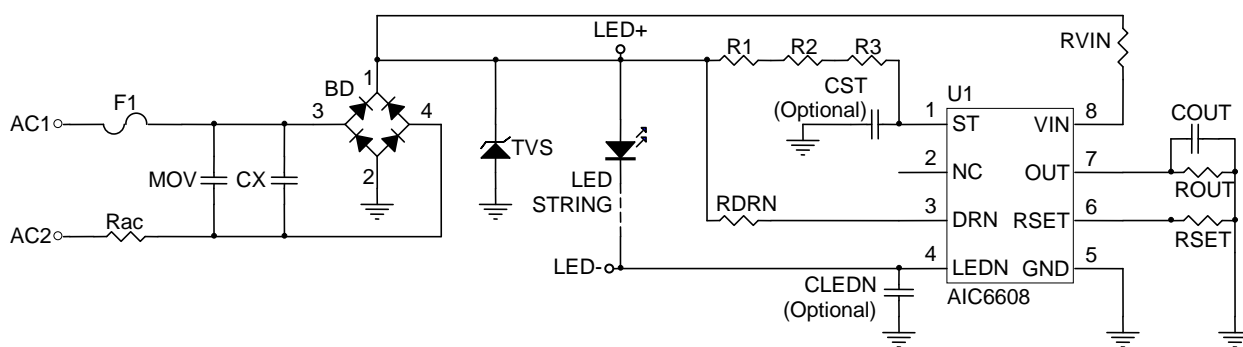
DESCRIPTION

The AIC6608 is a dimmable off-line linear LED driver that is compatible with TRIAC dimmer. The application of high bright LED is widely used for general illumination.

The AIC6608 can drive LEDs with a peak constant current of 50mA ~ 100mA. Multiple AIC6608 can also be used in parallel to provide higher currents.

The AIC6608 is available in a SOP-8 Exposed Pad package.

TYPICAL APPLICATION CIRCUIT



Typical Application Circuit

■ ORDERING INFORMATION

AIC6608X XX XX

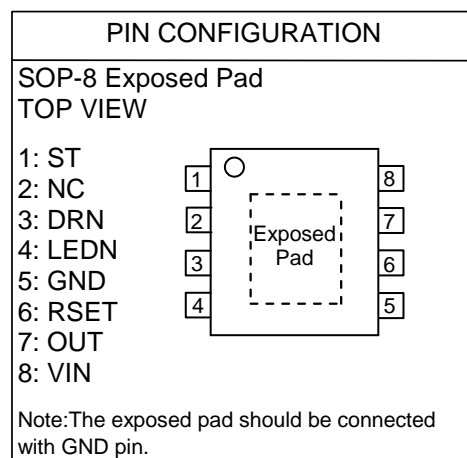
PACKING TYPE
TR: TAPE & REEL
TB: TUBE

PACKAGE TYPE
R8: SOP-8 Exposed Pad

G: GREEN PACKAGE

Example: AIC6608GR8TR

→ in SOP-8 Expose Pad Green Package
and TAPE & REEL Packing Type.



■ ABSOLUTE MAXIMUM RATINGS

VIN Pin Voltage	550V
LEDN, DRN Pin Voltage	550V
ST Pin Voltage	30V
OUT Pin Voltage	6V
RSET Pin Voltage	6V
Operating Ambient Temperature Range T_A	-40°C~85°C
Operating Maximum Junction Temperature T_J	150°C
Storage Temperature Range T_{STG}	-65°C~150°C
Lead Temperature (Soldering 10 Sec.)	260°C
Thermal Resistance Junction to Case SOP-8 Exposed Pad*	15°C /W
Thermal Resistance Junction to Ambient SOP-8 Exposed Pad*	60°C /W
(Assume no Ambient Airflow, no Heatsink)	

Absolute Maximum Ratings are those values beyond which the life of a device may be impaired.

*The package is place on a two layers PCB with 2 ounces copper and 2 square inch, connected by 8 vias.

■ ELECTRICAL CHARACTERISTICS

(T_J=25°C, unless otherwise specified) (Note 1)

PARAMETER	TEST CONDITIONS	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply Voltage Section						
V _{IN} Operation Voltage		V _{IN}	5		500	V
Quiescent Current	V _{IN} =310V	I _{VIN}		350		μA
Output LED Current (Note 2)						
LED Current Range	I _{LEDN}		50		100	mA
LED Current Tolerance	I _{LEDN}		-5		+5	%
Setting LED Current Section						
RSET Voltage	RSET=37.5kΩ	V _{RSET}		0.5		V
RSET Short	RSET=0 Ω	I _{S3}	110			mA
RSET Open	RSET=∞ Ω		0		1	mA
Over Temperature Protection						
Action Junction Temperature				140		°C

Note 1: Specifications are production tested at T_A=25°C. Specifications over the -40°C to 85°C operating temperature range are assured by design, characterization and correlation with Statistical Quality Controls (SQC).

Note 2: Output LED Current = peak to peak.

■ TYPICAL PERFORMANCE CHARACTERISTICS

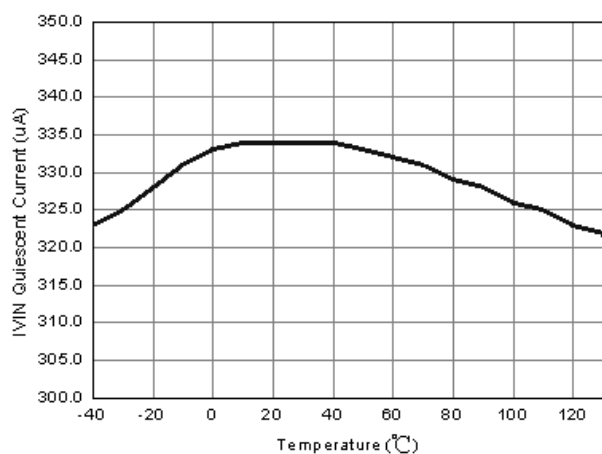


Fig.1 Quiescent Current

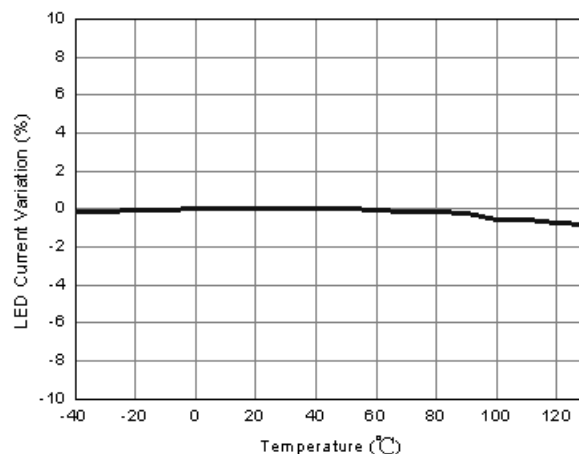


Fig.2 LED current vs. Temperature

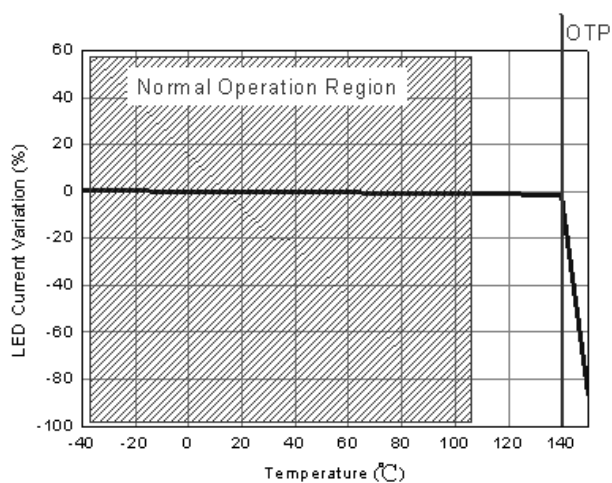
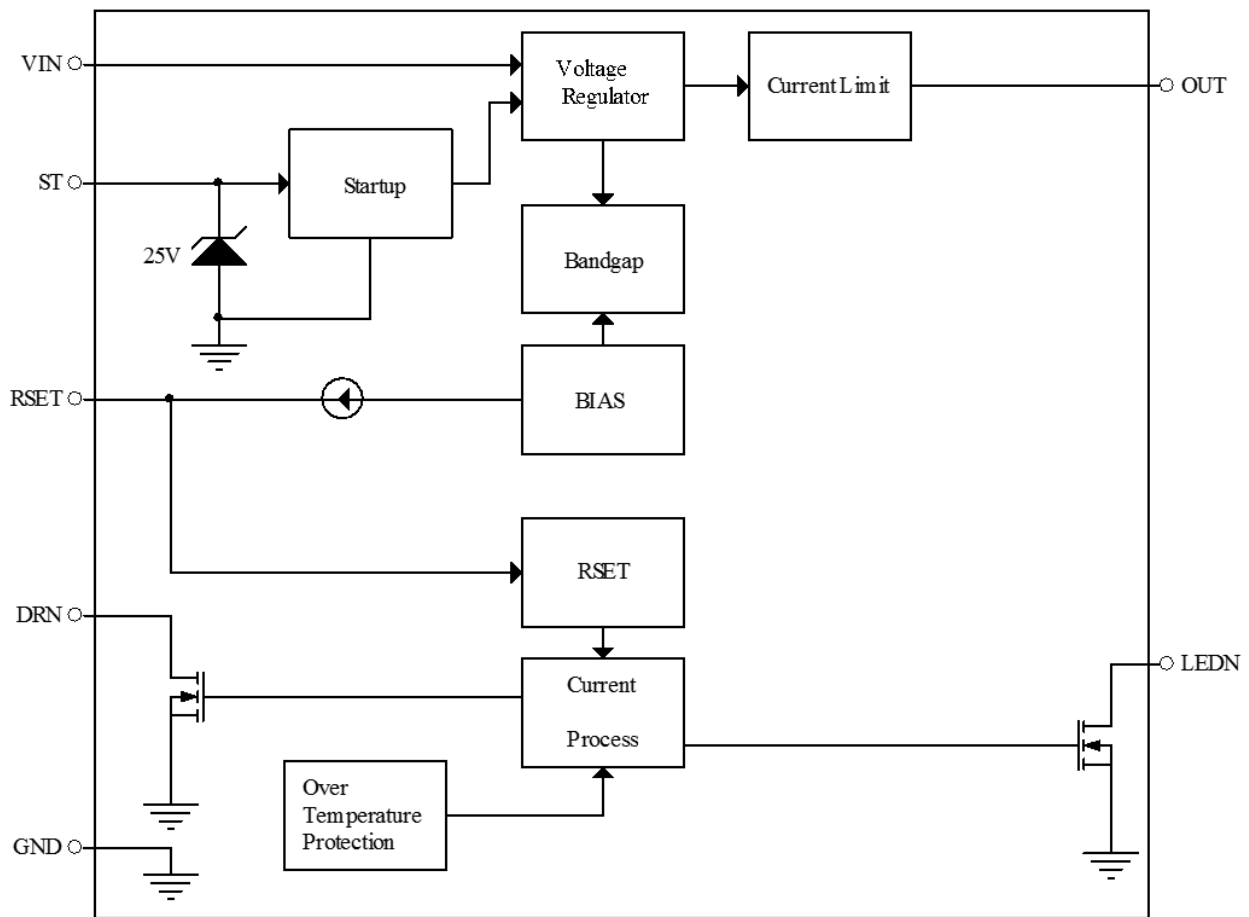


Fig.3 Over Temperature Protection

■ BLOCK DIAGRAM



Functional Block Diagram of AIC6608

■ PIN DESCRIPTION

- ST PIN -Provide the Startup Current for the Controller.
- VIN PIN -Power Supply Input.
- LEDN PIN -LED Cathode Connection.
- DRN PIN -Dummy Load Controller.
- OUT PIN -Connecting an Output Capacitor to Provide a Stable Voltage for the Internal Circuit.
- GND PIN -Ground.
- RSET PIN -Set output peak current.

■ APPLICATION INFORMATION

The AIC6608 is dimmable off-line constant current LED driver that is compatible with TRIAC dimmer. It can drive LEDs with a peak constant current of 50mA ~ 100mA. Multiple AIC6608 can also be used in parallel to provide higher LED current.

SOFT START

The AIC6608 has soft start function to reduce the inrush current during the start-up period. According to the different AC input voltage, the Table 1 provides the commanded component value for soft start resistor R_{ST} ($R_1 \sim R_3$).

Table 1

Input Voltage	Estimated R_{ST} Resistor Value
AC110V	12.2M Ω
AC120V	13.7M Ω
AC220V	25.1M Ω
AC240V	27.5M Ω

DUMMY LOAD CONTROLLER

In order to achieve stable light output when the TRIAC dimmer is used, AIC6608 designs the dummy load control function. By using a suitable dummy load R_{DRN} , the stability of light output can be improved when using the TRIAC dimmer. However, the electrical characteristics of all kinds of TRIAC dimmer are not the same. When the different TRIAC dimmer is used, the suitable dummy load may be different. In order to achieve more stable light output, the dummy load should be adjusted in accordance with the used TRIAC dimmer.

OUTPUT CAPACITOR, INPUT RESISTOR & OUTPUT RESISTOR

By connecting an output capacitor to the OUT pin and an input resistor to the VIN pin, a stable voltage can be provided for the internal circuit of AIC6608. A 1 μ F~10 μ F output ceramic capacitor is commanded for most AIC6608 applications. When choosing the output ceramic capacitor, X5R and X7R types are recommended because they retain their capacitance over wider ranges of voltage and

temperature than other types. In addition, the input resistance of R_{VIN} must be larger than 33K Ω . When choosing the SMD input resistor, the SMD input resistor size must be bigger than 0805 size.

When using the TRIAC dimmer, the stability of light output can be improved by using a suitable output resistor, R_{OUT} , in parallel with output capacitor. However, when the different TRIAC dimmer or LED string is used, the suitable output resistor may be different. In order to achieve more stable light output, the output resistor should be adjusted in accordance with the used TRIAC dimmer or LED string.

SETTING OUTPUT LED PEAK CURRENT

The output LED peak current of AIC6608 can be set by the external resistor R_{SET} . The relationship between $I_{OUT-PEAK}$ and R_{SET} is

$$R_{SET} = 3150/I_{OUT-PEAK}$$

THERMAL REGULATION

The AIC6608 includes the thermal-regulation circuit, which is designed to protect the device from excessive temperature. The internal thermal-regulation circuit adjusts the LED current if the junction temperature rises above the preset value of about 140°C.

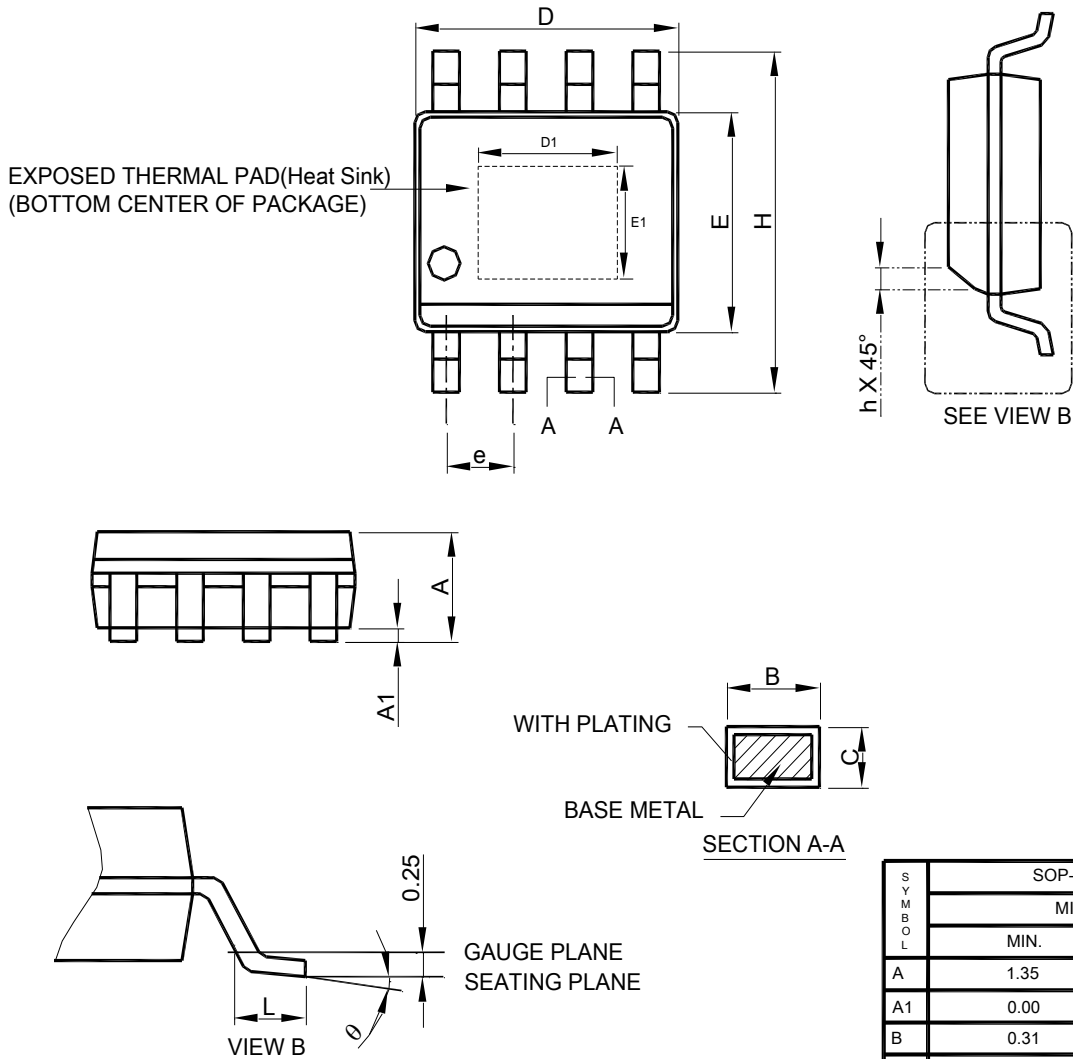
POWER DISSIPATION

The maximum power dissipation of AIC6608 depends on the thermal resistance of its case and circuit board, the temperature difference between the die junction and ambient air, and the rate of airflow. The rate of temperature rise is greatly affected by the mounting pad configuration on the PCB, the board material, and the ambient temperature. When the IC mounting with good thermal conductivity is used, the junction temperature will be low even when large power dissipation applies.

As a general rule, the lower temperature is, the better reliability of the device is. So the PCB mounting pad should provide maximum thermal conductivity to maintain low device temperature.

■ PHYSICAL DIMENSIONS

● SOP-8 Exposed Pad



Note : 1. Refer to JEDEC MS-012E.

2. Dimension "D" does not include mold flash, protrusions or gate burrs. Mold flash, protrusion or gate burrs shall not exceed 6 mil per side .
3. Dimension "E" does not include inter-lead flash or protrusions.
4. Controlling dimension is millimeter, converted inch dimensions are not necessarily exact.

SYMBOL	SOP-8 Exposed Pad	
	MILLIMETERS	
	MIN.	MAX.
A	1.35	1.75
A1	0.00	0.15
B	0.31	0.51
C	0.17	0.25
D	4.80	5.00
D1	1.50	3.50
E	3.80	4.00
E1	1.0	2.55
e	1.27 BSC	
H	5.80	6.20
h	0.25	0.50
L	0.40	1.27
θ	0°	8°

Note:

Information provided by AIC is believed to be accurate and reliable. However, we cannot assume responsibility for use of any circuitry other than circuitry entirely embodied in an AIC product; nor for any infringement of patents or other rights of third parties that may result from its use. We reserve the right to change the circuitry and specifications without notice.

Life Support Policy: AIC does not authorize any AIC product for use in life support devices and/or systems. Life support devices or systems are devices or systems which, (i) are intended for surgical implant into the body or (ii) support or sustain life, and whose failure to perform, when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.