Off-Line Linear LED Driver

FEATURES

- Constant Current Regulator
- Wide Range, Programmable LED Voltage
- Current Operation: 15mA ~ 50mA
- 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 & TO252-5 Package
- Patent Pending Drive Architecture

DESCRIPTION

The AIC6607 is an off-line linear LED driver. The application of high bright LED is widely used for general illumination.

The AIC6607 can drive LEDs with a constant current of 15mA ~ 50mA. Multiple AIC6607 can also be used in parallel to provide higher currents.

The AIC6607 is available in a SOP-8 Exposed Pad Package & TO252-5 Package.

APPLICATIONS

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

TYPICAL APPLICATION CIRCUIT

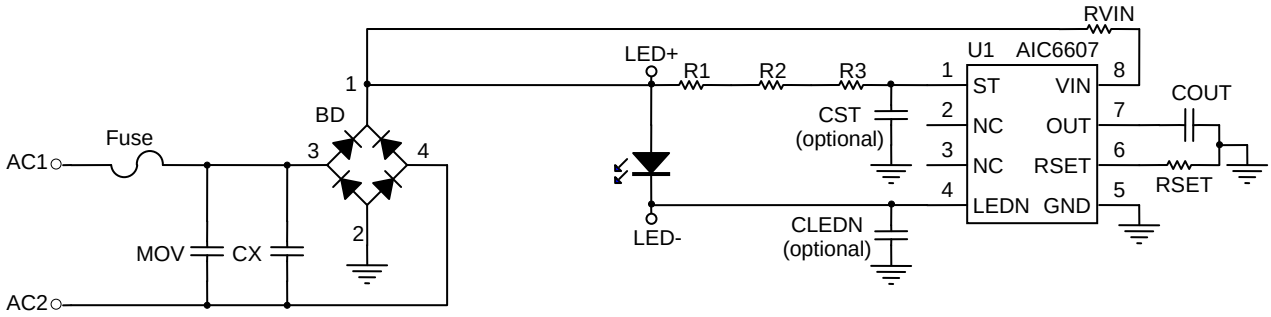


Fig.1. Typical Application Circuit for SOP-8 Exposed Pad

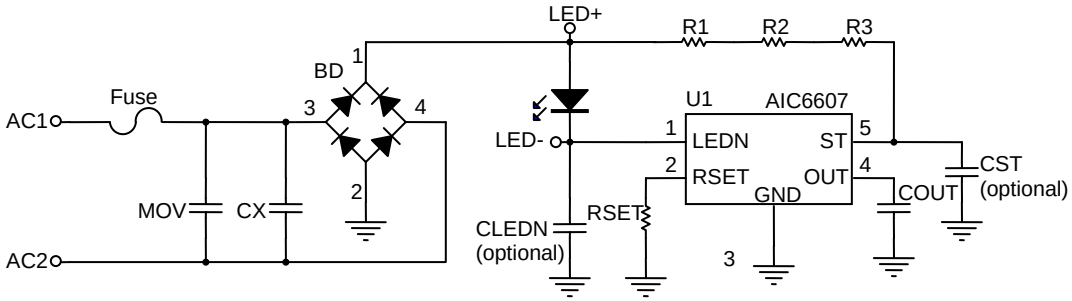


Fig.2. Typical Application Circuit for TO252-5

ORDERING INFORMATION

AIC6607X XX XX

- PACKING TYPE
  TR: TAPE & REEL
  TB: TUBE
- PACKAGE TYPE
  R8: SOP-8 Exposed Pad
  E5: TO252-5
- G: GREEN PACKAGE

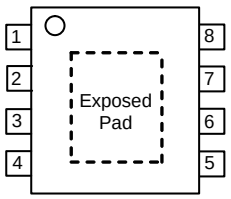
Example: AIC6607GR8TR

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

PIN CONFIGURATION

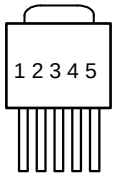
SOP-8 Exposed Pad
TOP VIEW

1: ST
2: NC
3: NC
4: LEDN
5: GND
6: RSET
7: OUT
8: VIN



Note:The exposed pad should be connected with GND pin.

TO252-5
TOP VIEW
1: LEDN
2: RSET
3: GND (TAB)
4: OUT
5: ST



ABSOLUTE MAXIMUM RATINGS

VIN Pin Voltage 550V

LEDN Pin Voltage 550V

ST Pin Voltage 30V

OUT Pin Voltage 6V

RSET Pin Voltage 6V

Operating Ambient Temperature Range T_A ..... -40ºC~85ºC

Operating Maximum Junction Temperature T_J 150ºC

Storage Temperature Range T_{STG} ..... -65ºC~150ºC

Lead Temperature (Soldering 10 Sec.)..... 260ºC

Thermal Resistance Junction to Case SOP-8 Exposed Pad* ..... 15ºC /W

TO252-5..... 8ºC /W

Thermal Resistance Junction to Ambient SOP-8 Exposed Pad*…..... 60ºC /W

TO252-5..... 100ºC /W

(Assume no Ambient Airflow)

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}		15		50	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=0Ω	I_{S3}	55		80	mA
RSET Open	RSET=∞Ω		0		1	mA
Over Temperature Protection						
Action Junction Temperature				140		℃

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

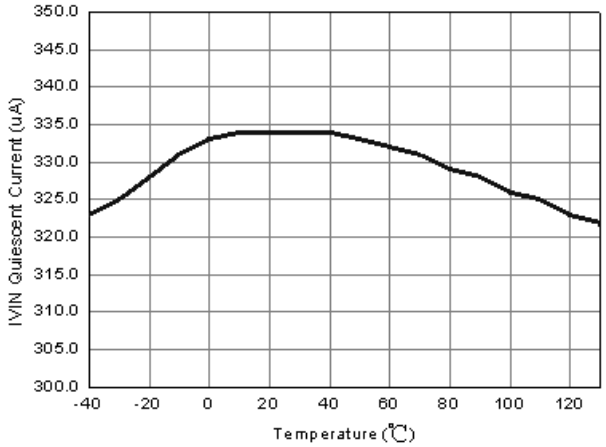


Fig.3 Quiescent Current

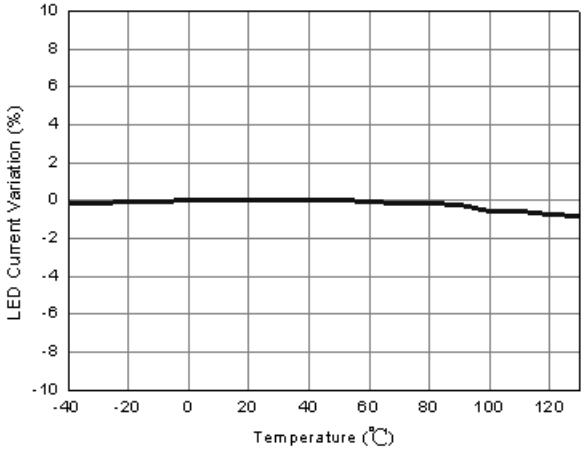


Fig.4 LED current vs. Temperature

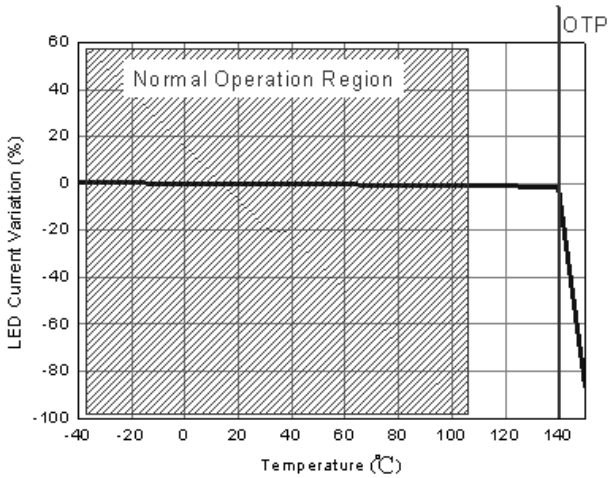
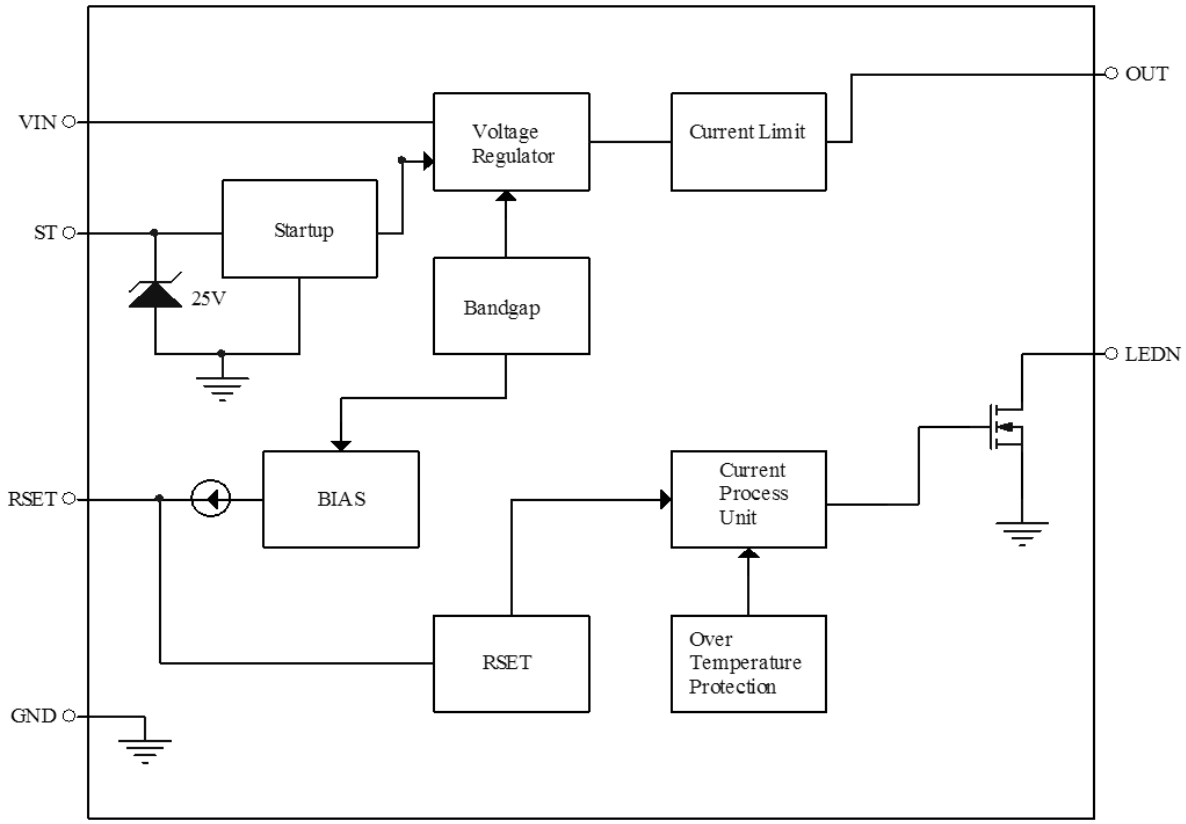


Fig.5 Over Temperature Protection

BLOCK DIAGRAM



Functional Block Diagram of AIC6607

PIN DESCRIPTION

ST PIN -Provide the Startup Current for the Controller.
VIN PIN -Power Supply Input. (For SOP-8 Package)
LEDN PIN -LED N Cathode Connection.
RSET PIN -Set Output Peak Current.
OUT PIN -Connecting an Output Capacitor to Provide a Stable Voltage for the Internal Circuit.
GND PIN -Ground.

APPLICATION INFORMATION

The AIC6607 is off-line constant current LED driver. It can drive LEDs with a constant current of 15mA ~ 50mA. Multiple AIC6607 can also be used in parallel to provide higher LED current.

SOFT START

The AIC6607 has soft start function to reduce the inrush current during the start-up period. According to the different AC input voltage, the Table 01 provides the commanded component value for soft start resistor R_{ST} (R_1~R_3).

Table 01

Input Voltage	Estimated R_{ST} Resistor Value
AC110V	10.5MΩ
AC120V	11.0MΩ
AC220V	20.5MΩ
AC240V	22.0MΩ

OUTPUT CAPACITOR & INPUT 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 AIC6607. A 1μF~10μF output ceramic capacitor is commanded for most AIC6607 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 33kΩ. When choosing the SMD input resistor, the SMD input resistor size must be bigger than 0805 size.

SETTING OUTPUT LED PEAK CURRENT

The output LED peak current of AIC6607 can be set by the external resistor R_{SET}. The relationship between $I_{OUT-PEAK}$ and R_{SET} is

$R_{SET} = 750/I_{OUT-PEAK}$

THERMAL REGULATION

The AIC6607 includes the thermal-regulation circuit, which are 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 140ºC.

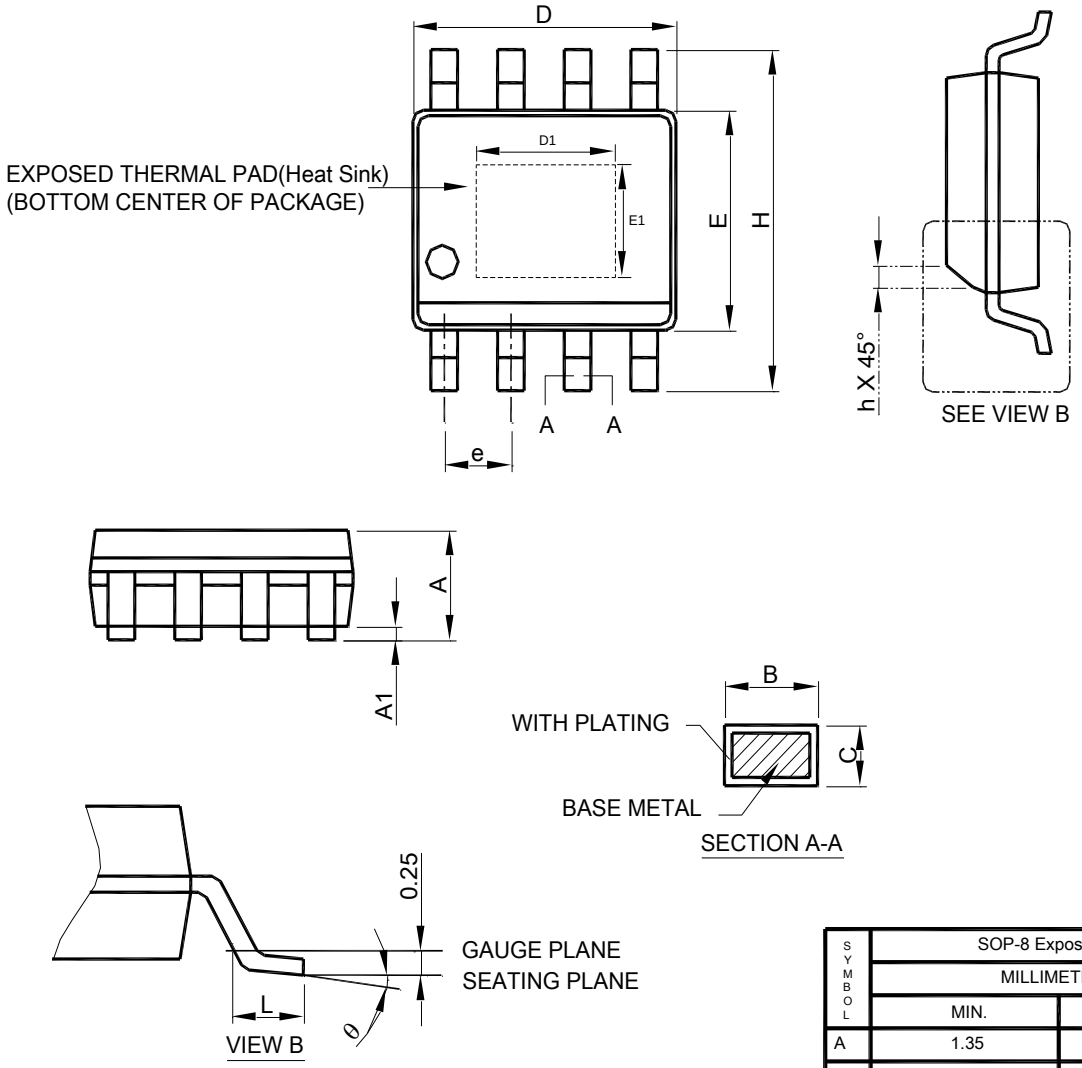
POWER DISSIPATION

The maximum power dissipation of AIC6607 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

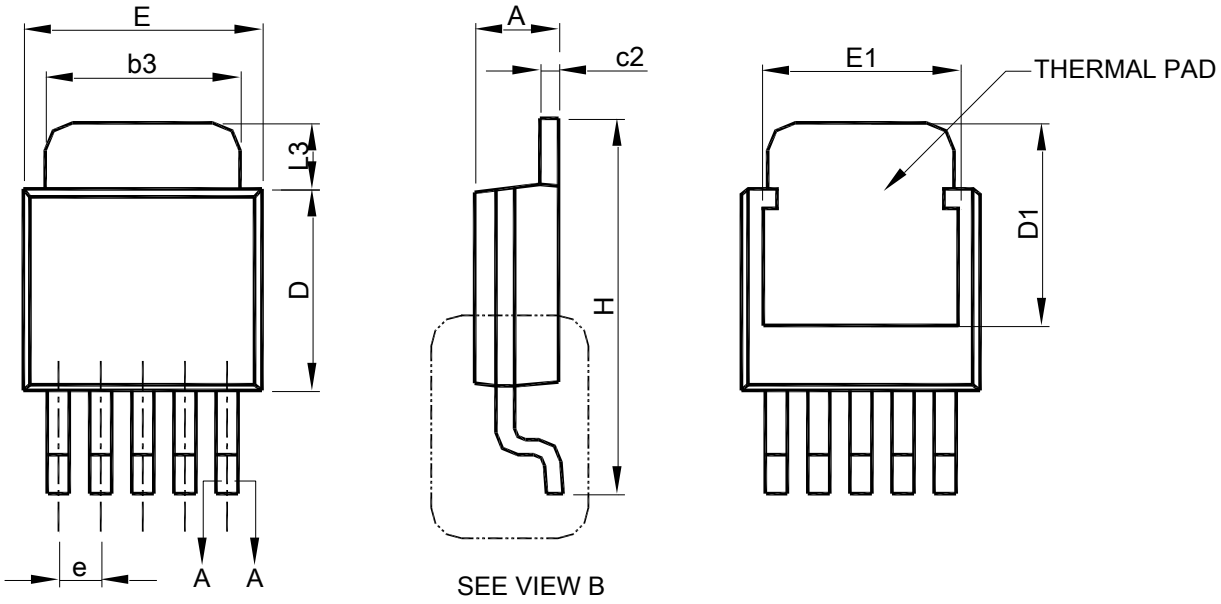
- **SOP-8 Exposed Pad**

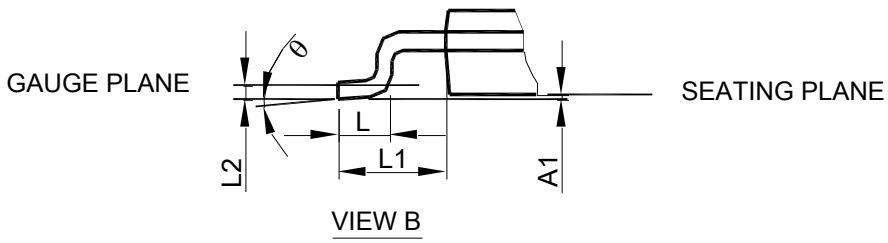


SYMBOL	SOP-8 Exposed Pad	
	MILLIMETERS	
	MIN.	MAX.
A	1.35	1.75
A1	0.00	0.15
B	0.31	0.51
C	0.17	0.25
D	4.80	5.00
D1	1.50	3.50
E	3.80	4.00
E1	1.0	2.55
e	1.27 BSC	
H	5.80	6.20
h	0.25	0.50
L	0.40	1.27
θ	0°	8°

Note : 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.

- **TO252-5**





SYMBOL	TO252-5	
	MILLIMETERS	
	MIN.	MAX.
A	2.19	2.38
A1	0.00	0.13
b	0.51	0.71
b3	4.32	5.46
c	0.46	0.61
c2	0.46	0.89
D	5.33	6.22
D1	4.90	6.00
E	6.35	6.73
E1	4.32	5.33
e	1.27 BSC	
H	9.40	10.41
L	1.40	1.78
L1	2.67 REF	
L2	0.51 BSC	
L3	0.89	2.03
θ	0°	8°

Note: 1. Refer to JEDEC TO-252AD and AB.
2. Dimension "E" does not include mold flash, protrusions or gate burrs. Mold flash, protrusion or gate burrs shall not exceed 6 mil per side .
3. Dimension "D" does not include inter-lead flash or protrusions.
4. Controlling dimension is millimeter, converted inch dimensions are not necessarily exact.