

LC 1209

60V Input / 5V Output Linear Regulator

DESCRIPTION

LC1209 is a three-terminal positive regulator with an output voltage of 5.0V and output current up to 100mA. The device features a typical output tolerance of $\pm 5\%$. And its input voltage can stand a voltage as high as 60V.

LC1209 includes high accuracy voltage reference, error amplifier, TSD circuit and output driver module.

LC1209 offers thermal shut down functions to assure the stability of chip and power system.

LC1209 is available in SOT89-3, TO-92 and TO-220 power packages.

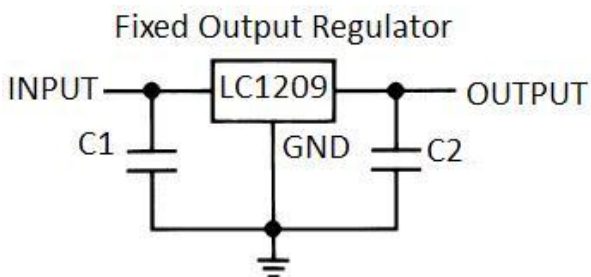
FEATURES

- Maximum output current up to 100mA
- Output voltage tolerances of $\pm 5\%$ over the temperature range
- Internal thermal over-temperature protection
- High input voltage (up to 60V)
- Low Power Consumption: 80uA (Typ.)
- Available in plastic TO-92 and plastic TO-220 packages
- No external components

APPLICATIONS

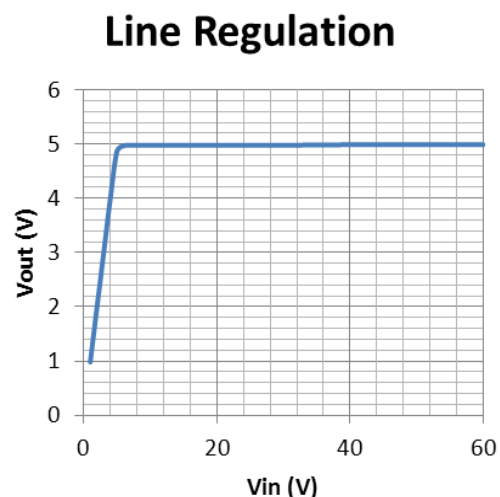
- Battery Powered equipment
- Communication equipment
- Audio/Video equipment

TYPICAL APPLICATION



NOTE: Input capacitor ($C1=0.33\mu F$) and Output capacitor ($C2=0.1\mu F$) are recommended in all application circuit. Tantalum capacitor is recommended.

ELECTRICAL CHARACTERISTICS

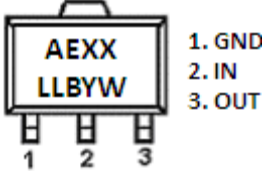
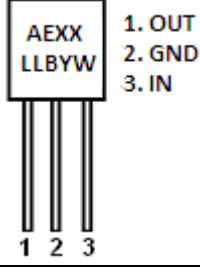
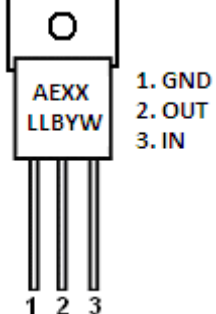


ORDERING INFORMATION

LC1209 [1](#) [2](#) [3](#) [4](#) [5](#)

| Code | Description |
|-------------------|--|
| 1 | Temperature&RoHS: C:-40~85°C ,Pb Free RoHS Std. |
| 2 | Package type: C3:SOT-89-3 H:TO-92 N: TO220 |
| 3 | Packing type: TR:Tape&Reel (Standard) BG:Bag (TO-92) |
| 4 | Output voltage: e.g. 11=1.1V 15=1.5V 55=5.5V |
| 5 | Voltage accuracy: 2=±2% Blank(default)=±5% |

PIN CONFIGURATION

| | | |
|---------------------|--------------------|---|
| Marking Explanation | | LC1209CC3TR50 SOT89-3 |
| AEXX LLBYW | N: Product Code |  |
| | XX: Output Voltage | |
| | LL: LOT NO. | |
| | B: FAB Code | |
| | YW: Date Code | |
| Marking Explanation | | LC1209CHBG50 TO92 |
| AEXX LLBYW | N: Product Code |  |
| | XX: Output Voltage | |
| | LL: LOT NO. | |
| | B: FAB Code | |
| | YW: Date Code | |
| Marking Explanation | | LC1209CHBG50 TO220 |
| AEXX LLBYW | N: Product Code |  |
| | XX: Output Voltage | |
| | LL: LOT NO. | |
| | B: FAB Code | |
| | YW: Date Code | |

RECOMMENDED WORK CONDITIONS

| Parameter | Value |
|------------------------------------|-------------|
| Input Voltage Range | 7V - 60V |
| Operating Junction Temperature(Tj) | -20°C -85°C |

ABSOLUTE MAXIMUM RATING

| Parameter | | Value |
|------------------------------------|---------|--------------|
| Max Input Voltage | | 60V |
| Max Output Current | | 100mA |
| Operating Junction Temperature(Tj) | | 150°C |
| Ambient Temperature(Ta) | | -40°C –85°C |
| Power Dissipation | TO-92 | 0.5 W |
| | TO-220 | 1 W |
| | SOT89-3 | 0.5W |
| Storage Temperature(Ts) | | -40°C -150°C |
| Lead Temperature & Time | | 260°C, 10s |

Note:

- Exceed these limits may cause damage to the device.
- Exposure to absolute maximum rating conditions may affect device reliability.

ELECTRICAL CHARACTERISTICS

(Test Conditions: $C_{in}=0.33\mu F, C_{out}=0.1\mu F, T_A=25^\circ C$, Unless otherwise specified.)

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---------------------|-------------------------|---|------|------|-----------|--------|
| Vin | Input Voltage | | | | 60 | V |
| Vout | Output Voltage | $1mA \leq I_{out} \leq 40mA$ $7V \leq V_{in} \leq 20V$ | 4.75 | 5.0 | 5.25 | V |
| ΔV_{out} | Line Regulation | $7V \leq V_{in} \leq 20V$ | - | - | 200 | mV |
| ΔV_{out} | Load Regulation | $1mA \leq I_{out} \leq 100mA$ | - | - | 150 | mV |
| Iout(Max.) | Maximum Output | $V_{in}-V_{out}=1.5V$ | 100 | | | mA |
| Iq | Quiescent Current | $V_{in}-V_{out}=1.25V$ | - | 0.08 | 0.15 | mA |
| $\Delta V/\Delta T$ | Temperature coefficient | $V_{in}=6.5V,$ $25^\circ C \leq Temp \leq 85^\circ C$ | | | ± 100 | ppm |
| TSD | Over Temperature | $V_{in}=6.5V, I_{out}=1mA$ | 150 | | | °C |
| θ_{JC} | Thermal Resistor | TO-92 | | 10 | | °C / W |
| | | TO-220 | | 4.5 | | |
| | | SOT89-3 | | 20 | | |

Note1: All test are conducted under ambient temperature 25°C and within a short period of time 20ms

BLOCK DIAGRAM

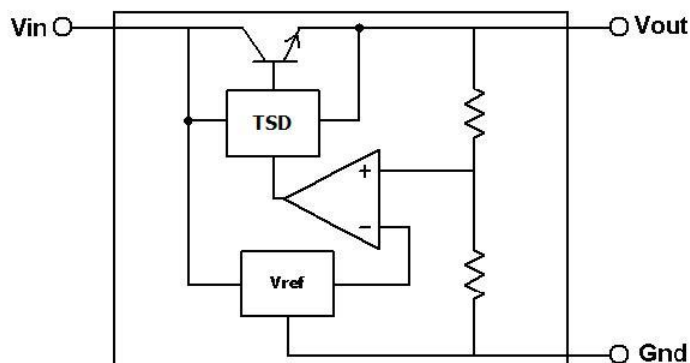


Fig.1 Block Diagram

EXPLANATION and THERMAL CONSIDERATION

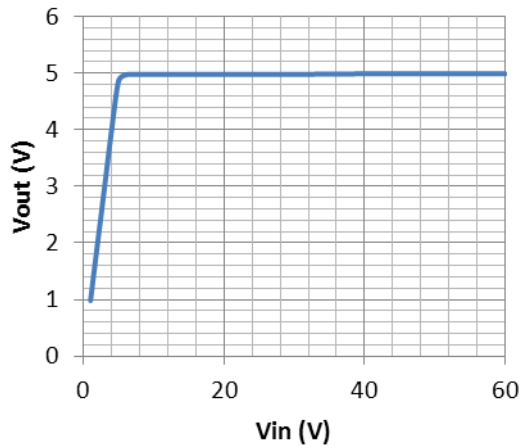
LC1209 is a series of low dropout voltage and low power consumption regulator. Its application circuit is very simple, which only needs two outside capacitors.

We have to take heat dissipation into great consideration when voltage of input is high. Because in such cases, the power dissipation consumed by LC1209 is very large. LC1209 uses SOT-89-3 package type and its thermal resistance is about $20^{\circ}\text{C}/\text{W}$. And the copper area of application board can affect the total thermal resistance. If copper area is $5\text{cm} \times 5\text{cm}$ (two sides), the resistance is about $30^{\circ}\text{C}/\text{W}$. So the total thermal resistance is about $20^{\circ}\text{C}/\text{W} + 30^{\circ}\text{C}/\text{W}$. We can decrease total thermal resistance by increasing copper area in application board. When there is no good heat dissipation copper are in PCB, the total thermal resistance will be as high as $120^{\circ}\text{C}/\text{W}$, then the power dissipation of LC1209 could allow on itself is less than 1W . And furthermore, LC1209 will work at junction temperature higher than 125°C under such condition and no lifetime is guaranteed.

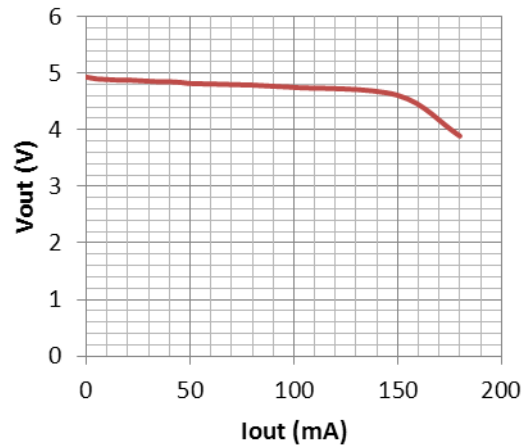
TYPICAL PERFORMANCE CHARACTERISTICS

($T=25^{\circ}\text{C}$ unless specified.)

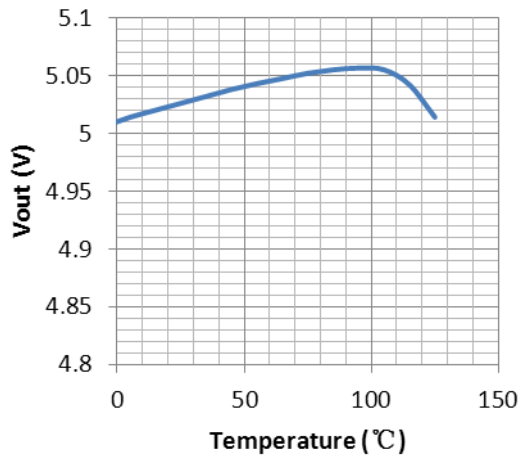
Line Regulation



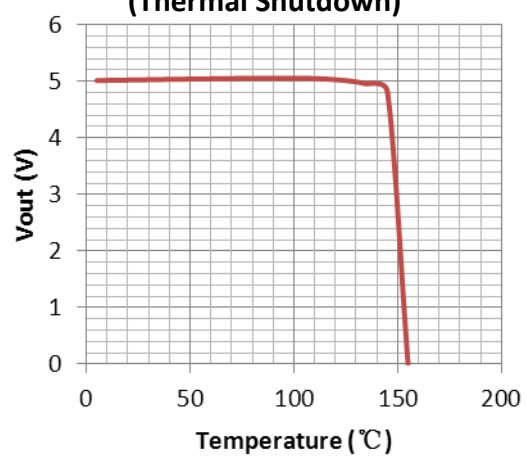
Load Regulation



Temperature Coefficient



TSD (Thermal Shutdown)



PACKAGE OUTLINE

| Package | TO-92 | Device per Box | 1000 | Unit | mm |
|--|-------|----------------|------|------|----|
| Package specification: | | | | | |
| <p style="text-align: center;">DIMENSIONS ARE IN MILLIMETERS</p> | | | | | |

| Package | SOT-89-3 | Devices per reel | 1000 | Unit | mm |
|------------------------|----------|------------------|------|------|----|
| Package specification: | | | | | |
| | | | | | |

PACKAGE OUTLINE (Continued)

| Package | TO-220 | Devices per reel | | Unit | mm |
|---|--------|------------------|--|------|----|
| Package specification: | | | | | |
| <p>The technical drawing illustrates the TO-220 package specification for the LC1209. It includes three views: a front view, a side view, and a top view. The front view shows a central circular feature with a diameter of $\phi 3.60 \pm 0.10$ mm. The overall width is 9.90 ± 0.20 mm, with a mounting hole diameter of 8.70 mm. The total height is 18.95 mm maximum. The side view shows a maximum height of 15.90 ± 0.20 mm and a width of 4.50 ± 0.20 mm. The top view shows a width of 10.00 ± 0.20 mm. Dimensions for the leads are also provided, including a lead width of 1.27 ± 0.10 mm and a lead thickness of $0.50^{+0.10}_{-0.05}$ mm.</p> | | | | | |