

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.

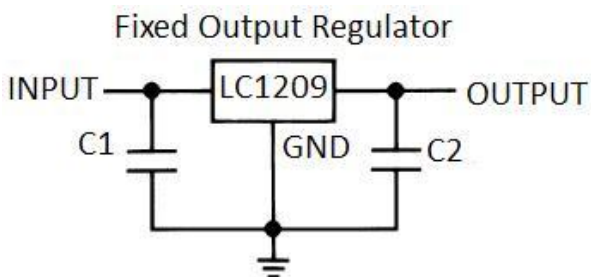
FEATURES

- 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

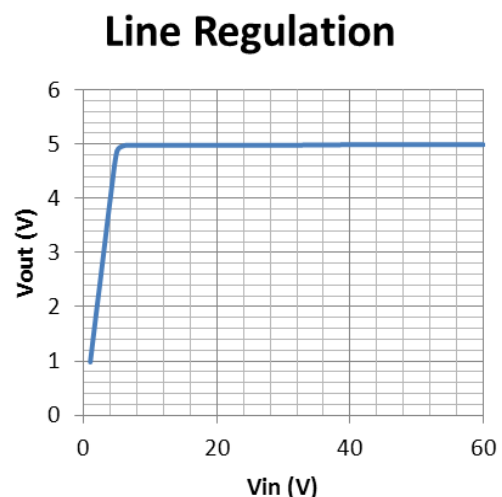
- Battery Powered equipment
- Communication equipment
- Audio/Video equipment

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

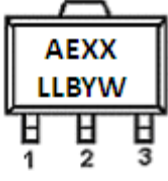




ORDERING INFORMATION

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	1. GND 2. IN 3. OUT
Marking Explanation		LC1209CHBG50 TO92
AEXX LLBYW	N: Product Code	
	XX: Output Voltage	
	LL: LOT NO.	
	B: FAB Code	
	YW: Date Code	1. OUT 2. GND 3. IN
Marking Explanation		LC1209CHBG50 TO220
AEXX LLBYW	N: Product Code	
	XX: Output Voltage	
	LL: LOT NO.	
	B: FAB Code	
	YW: Date Code	1. GND 2. OUT 3. IN

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

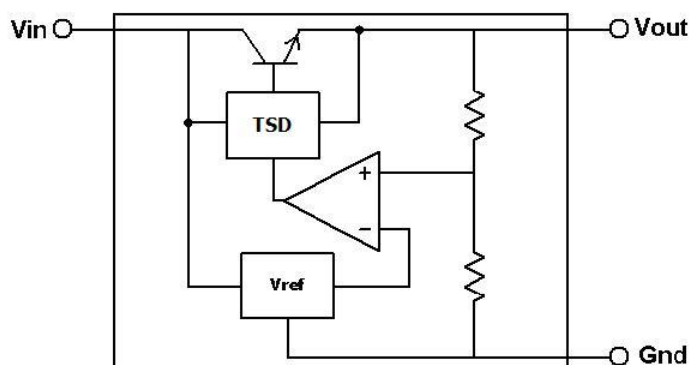


Fig.1 Block Diagram

EXPLANATION and THERMAL CONSIDERATION

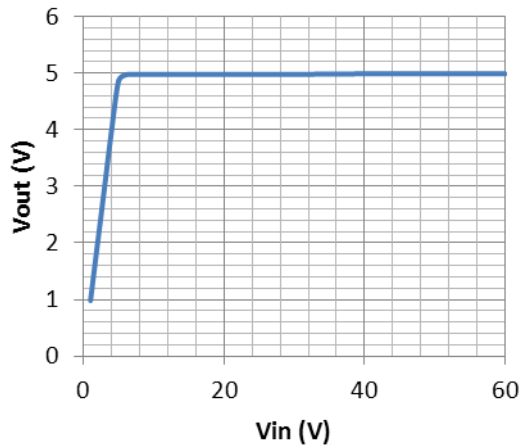
LC1209 is a series of low dropout voltage and low power consumption regulator. Its application circuit is very simple, which only needs two outside capacitors.

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.

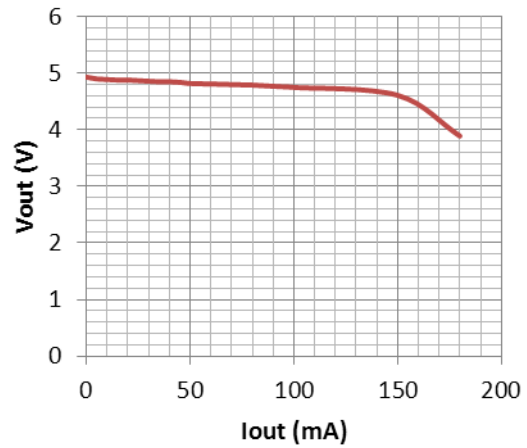
TYPICAL PERFORMANCE CHARACTERISTICS

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

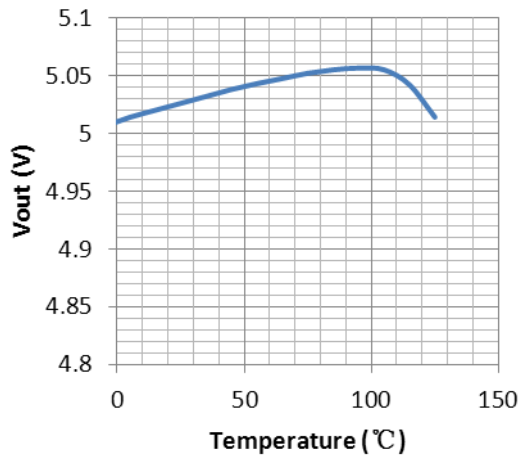
Line Regulation



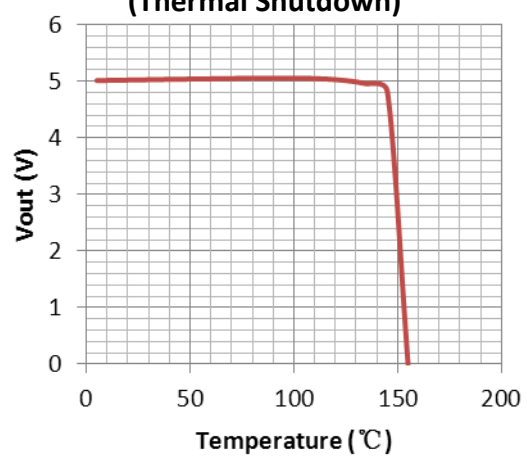
Load Regulation



Temperature Coefficient



TSD (Thermal Shutdown)



PACKAGE OUTLINE

Package	TO-92	Device per Box	1000	Unit	mm
Package specification:					
<p>Technical drawing of the TO-92 package. The front view shows a circular top with an 'EJECTION MARK' of diameter $\varnothing 1.6$ MAX and a depth of $\nabla 0.38$ MAX. The top diameter is 5.2 mm, with a tolerance of 4.7 mm. The height of the top is 5.2 mm, with a tolerance of 4.9 mm. The distance from the top to the base of the leads is 14.2 mm, with a tolerance of 12.7 mm. The lead spacing is 1.27 ± 0.05 mm, and the lead width is 0.55 mm TYP. The lead length is 2.54 ± 0.1 mm. The side view shows a top diameter of 4.19 mm, with a tolerance of 3.65 mm. The 'SEATING PLANE' is indicated. The lead diameter is 2.29 MAX (UNCONTROLLED LEAD DIA). The lead thickness is 0.50 mm, with a tolerance of 0.36 mm. The cross-sectional view shows a diameter of 2.27 mm, with a tolerance of 2.10 mm.</p> <p>DIMENSIONS ARE IN MILLIMETERS</p>					

Package	SOT-89-3	Devices per reel	1000	Unit	mm
Package specification:					
<p>Technical drawing of the SOT-89-3 package. The top view shows a rectangular body with a width of 4.5 ± 0.1 mm and a length of 1.6 ± 0.2 mm. The body height is 0.4 mm. The diameter of the central hole is $\varnothing 1.0$ mm. The distance from the hole to the edge is 2.5 ± 0.1 mm. The maximum height of the body is 4.25 MAX. The lead length is 0.8 MIN. The side view shows a top width of 1.5 ± 0.1 mm and a lead width of 0.4 ± 0.1 mm. The bottom view shows a lead width of 0.42 ± 0.2 mm, a lead spacing of 1.5 ± 0.1 mm, and a lead length of 0.47 ± 0.1 mm.</p>					

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 hole 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 MAX. The side view shows a maximum height of 15.90 ± 0.20 mm and a base width of 4.50 ± 0.20 mm. The top view shows a width of 10.00 ± 0.20 mm. Lead dimensions include a length of 13.08 ± 0.20 mm, a thickness of 1.27 ± 0.10 mm, and a lead angle of 45°. Typical lead spacing is 2.54 mm (range $[2.54 \pm 0.20]$ mm).</p>					