



# LT1084 5.0A LOW DROPOUT POSITIVE REGULATOR

### Features:

- Output Current - 5A
- Maximum Input Voltage – 12V
- Adjustable Output Voltage or Fixed
- 1.5V, 1.8V, 2.5V, 2.85V, 3.3V, 3.6V, 5V
- Current Limiting and Thermal Protection
- Standard 3-Pin Power Packages

### Applications:

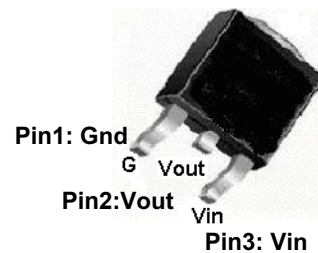
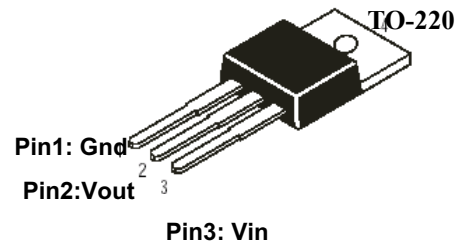
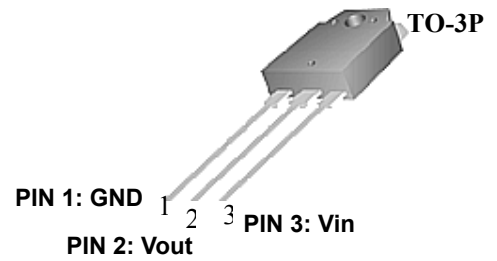
- Post Regulator for Switching DC/DC Converter
- High Efficiency Linear Regulators
- Battery Charger

### Operating Ratings:

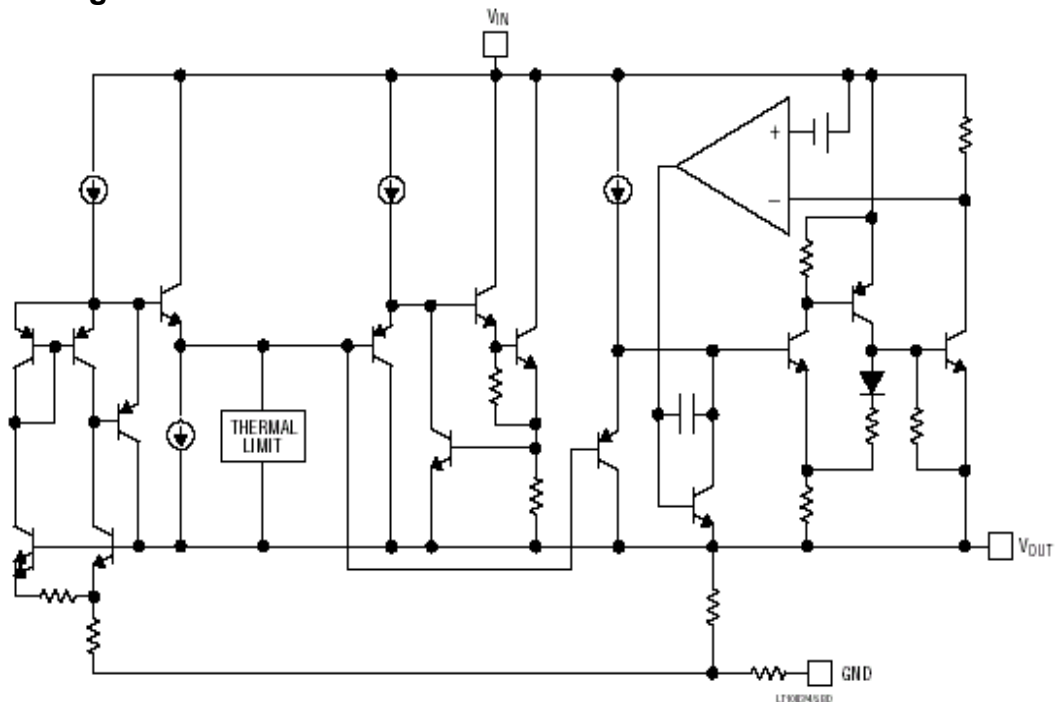
Junction Temperature Range: -10°C to 125°C

### Ordering Information:

Parameter Number	Package
LT1084	TO-3P
LT1084T	TO-220
LT1084D	TO-252



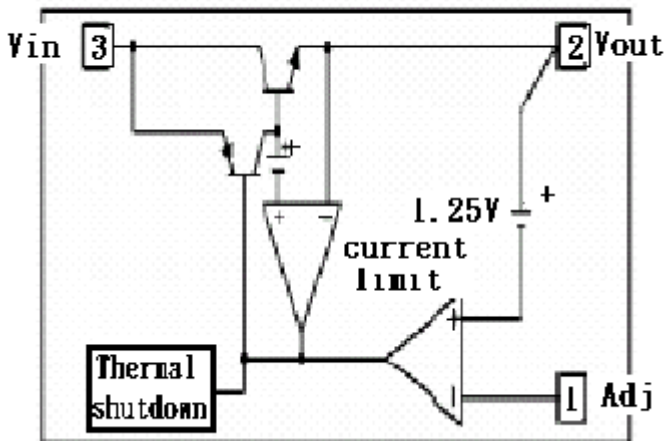
### Block Diagram



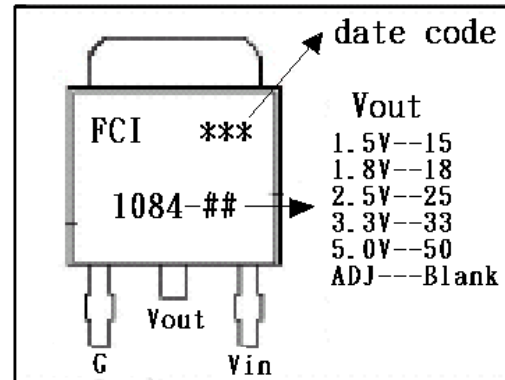


# LT1084 5.0A LOW DROPOUT POSITIVE REGULATOR

## Block Diagram



## Marking



## Pin Descriptions

Name	I/O	PIN#	FUNCTION
Adj (GND)		1	Adjustable (Ground only for fixed mode)
Vout	O	2	The output of the regulator. A minimum of 10 uF capacitor must be connected from this pin to ground to insure stability.
Vin	I	3	The input pin of regulator. Typically a large storage capacitor is connected from this pin to ground to insure that the input voltage does not sag below the minimum dropout voltage during the load transient response. This pin must always be 1.4V higher than Vout in order for the device to regulate properly.

## Functional Description

### Introduction

The **LT1084** adjustable Low Dropout (LDO) regulator is a 3 terminal device that can easily be programmed with the addition of two external resistors to any voltages within the range of 1.25V to 2.5V. The **LT1084** only needs 1.4V differential between  $V_{in}$  and  $V_{out}$  to maintain output regulation, the output voltage tolerances are also extremely tight and they include the transient response as part of the specification. For example, Intel VRE specification calls for a total of  $\pm 100mV$  including initial tolerance, load regulation and 0 to 5.0A load step. The **LT1084** is specifically designed to meet the fast current transient needs as well as providing an accurate initial voltage, reducing the overall system cost with the need for fewer output capacitors.

### Output Voltage Setting

The **LT1084** can be programmed to ANY VOLTAGES IN THE RANGE OF 1.25V TO 5V with the addition of  $R_1$  and  $R_2$  external resistors According to the following formula:

The **LT1084** keeps a constant 1.25V between the output pin and the adjust pin. By placing a resistor  $R_1$  across these two pins a constant current flows through  $R_1$ , adding to the  $I_{adj}$  current requirement of the **LT1084** IS 10mA,  $R_1$  is typically selected to be 121 $\Omega$  resistor so that it automatically satisfies the minimum current requirement. Notice that since  $I_{adj}$  is typically in the range of 55uA it only adds a small error to the output voltage and should only be considered when a very precise output voltage setting is required. For example, in a typical 3.3V application where  $R_1=121\Omega$  and  $R_2=200\Omega$  the error due to  $I_{adj}$  is only 0.3% of the nominal set point.

### Load Regulation

Since the **LT1084** is only a 3 terminal device, it is not possible to provide true remote sensing of the output voltage at the load.

The best load Regulation is achieved when the bottom side of  $R_2$  is connected to the load and the top-side of  $R_1$  resistor is connected directly to the case or the  $V_{out}$  pin of the regulator and not to the load. It is important to note that for high current applications, this can re-present a significant percentage of the overall load regulation and one must keep the path from the regulator to the load as short as possible to minimize this effect.

### Stability

The **LT1084** requires the use of an output capacitor as part of the frequency compensation in order to make the regulator stable. For most applications a minimum of 10uF aluminum electrolytic capacitor insures both stability and good transient response.

### Thermal Design

The **LT1084** incorporates an internal shutdown that protects the device when the junction temperature exceeds the maximum allowable junction temperatures. Although this device can operate with junction temperatures in the range of 150°C, it is recommended that the selected heat sink be chosen such that during maximum continuous load operation the junction temperature is kept below the temperature.

### Layout Consideration

The output capacitors must be located as close to the  $V_{out}$  terminal of the device as possible. It is recommended to use a section of a layer of the PC board as a plane to connect the  $V_{out}$  pin to the output capacitors to prevent any high frequency oscillation that may result due to excessive trace inductance.



# LT1084 5.0A LOW DROPOUT POSITIVE REGULATOR

## Electrical Characteristics:

Typicals and limits appearing in normal type apply for  $T_j=25^\circ\text{C}$ .

Limits appearing in Boldface type apply over the entire junction temperature range for operation

Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>Vref</b>	<b>Reference Voltage</b>	<b><math>I_o=10\text{mA}</math>, <math>T_j=25^\circ\text{C}</math>, <math>(V_{in}-V_{out})=1.5\text{V}</math></b>	<b>1.225</b>	<b>1.250</b>	<b>1.275</b>	<b>V</b>
Line Regu Load Regu	LT1084-Adj	$I_{OUT}=10\text{mA}$ , $V_{OUT}+1.5\text{V}<V_{in}<12\text{V}$ $V_{in}=3.3$ , $0\text{mA}<I_o<5\text{A}$ . $T_j=25^\circ\text{C}$ Note 1, 2	-	-	0.2 1.0	%
Line Regu Load Regu	LT1084-1.5	$I_o=10\text{mA}$ , $T_j=25^\circ\text{C}$ , $3\text{V}<V_{in}<12\text{V}$ $V_{in}=3\text{V}$ , $0\text{mA}<I_o<5\text{A}$ . $T_j=25^\circ\text{C}$ Note 1, 2	1.470	1.500 12	1.530 15	V mV
Line Regu Load Regu	LT1084-1.8	$I_o=10\text{mA}$ , $T_j=25^\circ\text{C}$ , $3.3\text{V}<V_{in}<12\text{V}$ $V_{in}=3.3\text{V}$ , $0\text{mA}<I_o<5\text{A}$ . $T_j=25^\circ\text{C}$ Note 1, 2	1.764	1.800 15	1.836 18	V mV
Line Regu Load Regu	LT1084-2.5	$I_o=10\text{mA}$ , $T_j=25^\circ\text{C}$ , $4\text{V}<V_{in}<12\text{V}$ $V_{in}=4\text{V}$ , $0\text{mA}<I_o<5\text{A}$ . $T_j=25^\circ\text{C}$ Note 1, 2	2.450	2.500 20	2.55 25	V mV
Line Regu Load Regu	LT1084-3.3	$I_o=10\text{mA}$ , $T_j=25^\circ\text{C}$ , $4.8\text{V}<V_{in}<12\text{V}$ $V_{in}=3\text{V}$ , $0\text{mA}<I_o<5\text{A}$ . $T_j=25^\circ\text{C}$ Note 1, 2	3.235	3.3 26	3.365 33	V mV
Line Regu Load Regu	LT1084-5.0	$I_o=10\text{mA}$ , $T_j=25^\circ\text{C}$ , $6.5\text{V}<V_{in}<12\text{V}$ $V_{in}=3\text{V}$ , $0\text{mA}<I_o<5\text{A}$ . $T_j=25^\circ\text{C}$ Note 1, 2	4.9	5.0 40	5.10 50	V mV
$\Delta V$	Dropout Voltage	$I_o=5.0\text{A}$ ( $\Delta V_{out}=1\% V_{out}$ )	-	1.3	1.4	V
	Current Limite	$V_{in}-V_{out}=5\text{V}$	5.1	-	-	A
	Mini Load Current		5.0	10.0	-	mA
	Temperature Stability	$I_o=10\text{mA}$	-	0.5	-	%
ThjA	Thermal Resistivity Junction-Ambient		-	98	-	C/W
ThjC	Thermal Resistivity Junction-Case		-	15	-	

Note1: See Thermal Regulation specifications for changes in output vol. due to heating effects. line and load regulation are measured at a constant junction Temp. by low duty cycle pulse testing. Load regulation is measured at the output lead=1/8" from the package

Note2: Line and load Regulation are guaranteed up to the max power dissipation of 15W power dissipation is determined by the difference between input and output and the current. Guaranteed max power dissipation will not be available over the full input/output range



# LT1084 5.0A LOW DROPOUT POSITIVE REGULATOR

## Performance Characteristics

