



LP2954/LP2954A

5V and Adjustable Micropower Low-Dropout Voltage Regulators

General Description

The LP2954 is a 5V micropower voltage regulator with very low quiescent current (90 μ A typical at 1 mA load) and very low dropout voltage (typically 60 mV at light loads and 470 mV at 250 mA load current).

The quiescent current increases only slightly at dropout (120 μ A typical), which prolongs battery life.

The LP2954 with a fixed 5V output is available in the three-lead TO-220 and TO-263 packages. The adjustable LP2954 is provided in an 8-lead surface mount, small outline package. The adjustable version also provides a resistor network which can be pin strapped to set the output to 5V. Reverse battery protection is provided.

The tight line and load regulation (0.04% typical), as well as very low output temperature coefficient make the LP2954 well suited for use as a low-power voltage reference.

Output accuracy is guaranteed at both room temperature and over the entire operating temperature range.

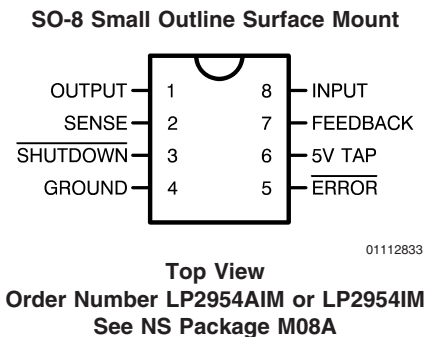
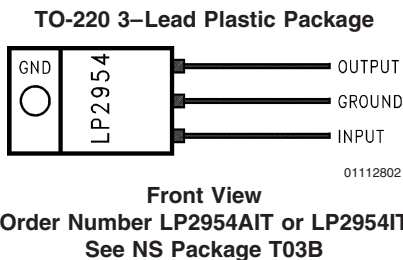
Features

- 5V output within 1.2% over temperature (A grade)
- Adjustable 1.23 to 29V output voltage available (LP2954IM and LP2954AIM)
- Guaranteed 250 mA output current
- Extremely low quiescent current
- Low dropout voltage
- Reverse battery protection
- Extremely tight line and load regulation
- Very low temperature coefficient
- Current and thermal limiting
- Pin compatible with LM2940 and LM340 (5V version only)
- Adjustable version adds error flag to warn of output drop and a logic-controlled shutdown

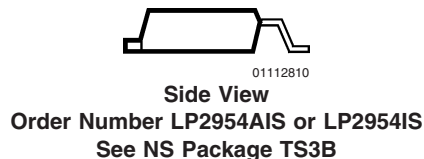
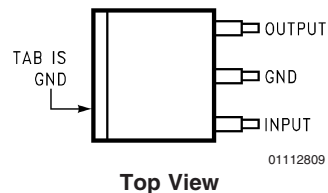
Applications

- High-efficiency linear regulator
- Low dropout battery-powered regulator

Package Outline and Ordering Information



TO-263 3-Lead Plastic Surface-Mount Package



Ordering Information

Order Number	Temp. Range (T _J) °C	Package (JEDEC)	NS Package Number
LP2954AIT	-40 to +125	TO-220	TO3B
LP2954IT			
LP2954AIS	-40 to +125	TO-263	TS3B
LP2954IS			
LP2954AIM	-40 to +125	SO-8	M08A
LP2954IM			

Absolute Maximum Ratings (Note 1)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Operating Junction Temperature Range
 LP2954A/LP2954I -40°C to +125°C

Storage Temperature Range -65°C to +150°C
 Lead Temperature (Soldering, 5 seconds) 260°C
 Power Dissipation (Note 2) Internally Limited
 Input Supply Voltage -20V to +30V
 ESD Rating 2 kV

Electrical Characteristics

Limits in standard typeface are for $T_J = 25^\circ\text{C}$, **bold typeface applies over the -40°C to +125°C temperature range.** Limits are guaranteed by production testing or correlation techniques using standard Statistical Quality Control (SQC) methods. Unless otherwise noted: $V_{IN} = 6\text{V}$, $I_L = 1\text{ mA}$, $C_L = 2.2\ \mu\text{F}$.

Symbol	Parameter	Conditions	Typical	2954AI		2954I		Units
				Min	Max	Min	Max	
V_O	Output Voltage		5.0	4.975	5.025	4.950	5.050	V
		$1\text{ mA} \leq I_L \leq 250\text{ mA}$	5.0	4.940	5.060	4.900	5.100	
$\frac{\Delta V_O}{\Delta T}$	Output Voltage Temp. Coefficient	(Note 3)	20		100		150	ppm/°C
$\frac{\Delta V_O}{V_O}$	Line Regulation	$V_{IN} = 6\text{V to }30\text{V}$	0.03		0.10		0.20	%
$\frac{\Delta V_O}{V_O}$	Load Regulation	$I_L = 1\text{ to }250\text{ mA}$			0.16		0.20	%
		$I_L = 0.1\text{ to }1\text{ mA}$ (Note 4)	0.04		0.20		0.30	
$V_{IN}-V_O$	Dropout Voltage (Note 5)	$I_L = 1\text{ mA}$	60		100		100	mV
		$I_L = 50\text{ mA}$	240		300		300	
		$I_L = 100\text{ mA}$	310		400		400	
		$I_L = 250\text{ mA}$	470		600		600	
I_{GND}	Ground Pin Current (Note 6)	$I_L = 1\text{ mA}$	90		150		150	μA
		$I_L = 50\text{ mA}$	1.1		2		2	mA
		$I_L = 100\text{ mA}$	4.5		6		6	
		$I_L = 250\text{ mA}$	21		28		28	
I_{GND}	Ground Pin Current at Dropout (Note 6)	$V_{IN} = 4.5\text{V}$	120		170		170	μA
I_{LIMIT}	Current Limit	$V_{OUT} = 0\text{V}$	380		500		500	mA
					530		530	
$\frac{\Delta V_O}{\Delta P_d}$	Thermal Regulation	(Note 7)	0.05		0.2		0.2	%/W

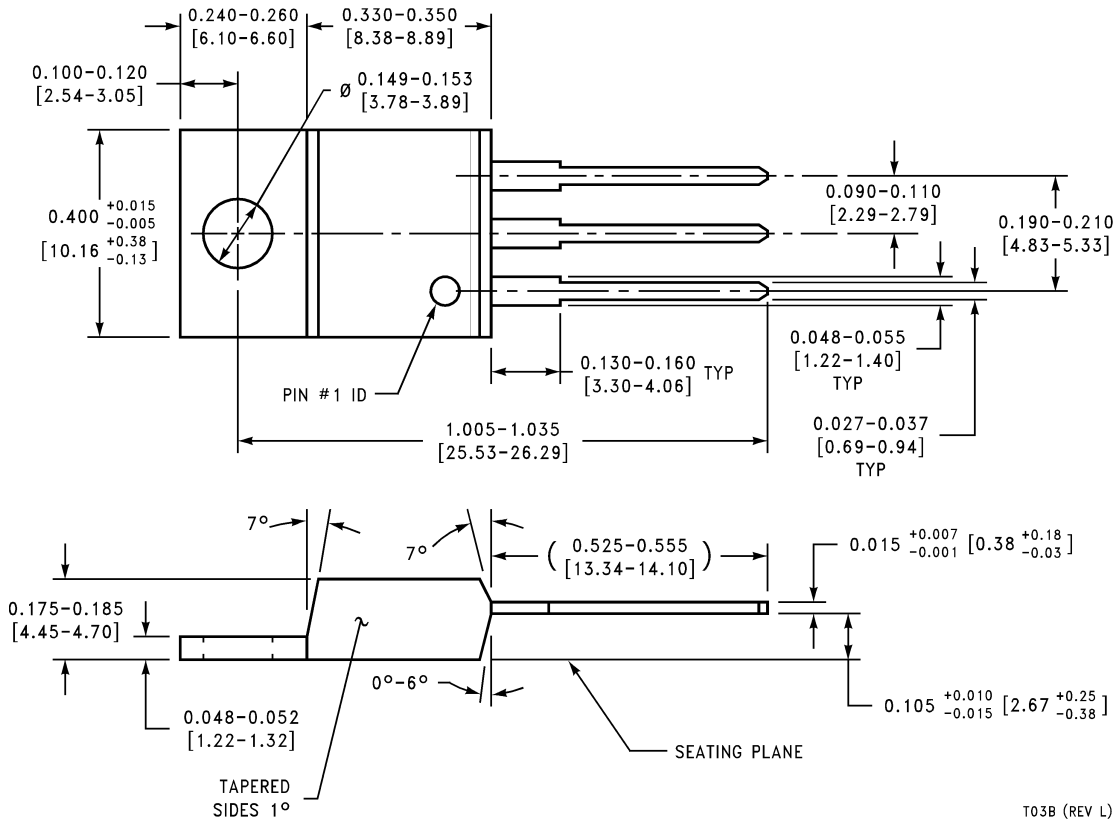
Electrical Characteristics (Continued)

Limits in standard typeface are for $T_J = 25^\circ\text{C}$, **bold typeface applies over the -40°C to $+125^\circ\text{C}$ temperature range.** Limits are guaranteed by production testing or correlation techniques using standard Statistical Quality Control (SQC) methods. Unless otherwise noted: $V_{IN} = 6\text{V}$, $I_L = 1\text{mA}$, $C_L = 2.2\ \mu\text{F}$.

Symbol	Parameter	Conditions	Typical	2954AI		2954I		Units
				Min	Max	Min	Max	
e_n	Output Noise Voltage (10 Hz to 100 kHz) $I_L = 100\text{mA}$	$C_L = 2.2\ \mu\text{F}$	400					$\mu\text{V RMS}$
		$C_L = 33\ \mu\text{F}$	260					
		$C_L = 33\ \mu\text{F}$ (Note 9)	80					
Additional Specifications for the Adjustable Device (LP2954AIM and LP2954IM)								
V_{REF}	Reference Voltage	(Note 10)	1.230	1.215 1.205	1.245 1.255	1.205 1.190	1.255 1.270	V
$\Delta V_{REF}/V_{REF}$	Reference Voltage Line Regulation	$V_{IN} = 2.5\text{V}$ to $V_{O(NOM)} + 1\text{V}$	0.03		0.1		0.2	%
		$V_{IN} = 2.5\text{V}$ to $V_{O(NOM)} + 1\text{V}$ to 30V (Note 11)			0.2		0.4	%
$\Delta V_{REF}/\Delta T$	Reference Voltage Temperature Coefficient	(Note 3)	20					ppm/ $^\circ\text{C}$
$I_B(\text{FB})$	Feedback Pin Bias Current		20		40 60		40 60	nA
I_{GND}	Ground Pin Current at Shutdown (Note 6)	$V_{SHUTDOWN} \leq 1.1\text{V}$	105		140		140	μA
$I_{O(\text{SINK})}$	Output "OFF" Pulldown Current	(Note 12)		30 20		30 20		mA
Dropout Detection Comparator								
I_{OH}	Output "HIGH" Leakage Current	$V_{OH} = 30\text{V}$	0.01		1 2		1 2	μA
V_{OL}	Output "LOW" Voltage	$V_{IN} = V_{O(NOM)} - 0.5\text{V}$ $I_{O(\text{COMP})} = 400\ \mu\text{A}$	150		250 400		250 400	mV
$V_{THR(\text{MAX})}$	Upper Threshold Voltage	(Note 13)	-60	-80 -95	-35 -25	-80 -95	-35 -25	mV
$V_{THR(\text{MIN})}$	Lower Threshold Voltage	(Note 13)	-85	-110 -160	-55 -40	-110 -160	-55 -40	mV
HYST	Hysteresis	(Note 13)	15					mV
Shutdown Input								
V_{OS}	Input Offset Voltage	(Referred to V_{REF})	± 3	-7.5 -10	7.5 10	-7.5 -10	7.5 10	mV
HYST	Hysteresis		6					mV
I_B	Input Bias Current	$V_{IN(\text{S/D})} = 0\text{V}$ to 5V	10	-30 -50	30 50	-30 -50	30 50	nA

Physical Dimensions inches (millimeters)

unless otherwise noted



TO-220 3-Lead Plastic Package
Order Number LP2954AIT or LP2954IT
NS Package T03B

T03B (REV L)