DATA SHEET

LinearDimensions SEMICONDUCTOR

# LND2950 / LND2951

## 100mA Low Dropout Voltage Regulators

## GENERAL DESCRIPTION

The LND2950-XX is a low power voltage regulator.This device is an excellent choice for use in battery powered application such as cordless telephone, radio control systems, and portable computers.
The LND2950-XX/LND2951-XX features very low quiescent current (75µA Typ.) and very low drop output voltage (Typ. 40mV at light load and 380mV at 100mA).This includes a tight initial tolerance of 0.5% typ., extremely good load and line regulation of 0.05% typ., and very low output temperature coefficient, making the LND2950-XX/LND2951-XX useful as a low-power voltage reference.
The error flag output feature is used as power-on reset, warning of a low output voltage, due to falling battery voltage on input. Another feature is the logic-compatible shutdown input, which enables the regulator to be switched on and off.
The LND2951-XX is available in 8 pin plastic packages. The regulator output voltage may be pin-strapped for a –XX voltage or programmed from 1.24 volts to 29 volts with an external pair of resistors.
The LND2950-XX is offered in a 3-pin TO-92 package compatible with other fixed regulators.

## DEVICE SELECTION GUIDE

| $V_{OUT}$, Volts | Device |
|---|---|
| 2.85* | LND2950-2.85,LND2951-2.85 |
| 3.0 | LND2950-3.0,LND2951-3.0 |
| 3.3 | LND2950-3.3, LND2951-3.3 |
| 5.0 | LND2950-5.0, LND2951-5.0 |

*Other versions are also available
Vout=2.0V TO 5.0V. Please consult for more information

## FEATURES

- High accuracy output voltage
- Guaranteed 100mA output
- Very low quiescent current
- Low dropout voltage
- Extremely tight load and line regulation
- Very low temperature coefficient
- Needs only 1µF for stability
- Error Flag warns of output dropout
- Logic-Controlled electronic shutdown
- Output programmable from 1.24 to 29V

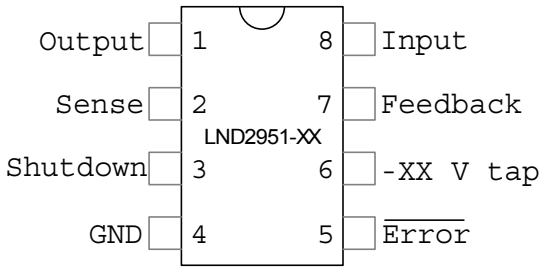
## APPLICATIONS

- Battery powered systems
- Cordless telephones
- Radio control systems
- Portable/Palm Top/ notebook computers
- Portable Instrumentation
- Avionics
- Automotive Electronics
- SMPS Post-Regulator
- Voltage Reference

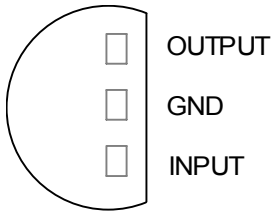
## ABSOLUTE MAXIMUM RATING

| Power Dissipation | Internally Limited |
|---|---|
| Lead Temperature (Soldering, 5 seconds) | 260º |
| Storage Temperature Range | -65ºC to+150ºC |
| Operating Junction Temperature Range | -55ºC to +150º |
| Input Supply Voltage | -0.3 to+30V |
| Feedback Input Voltage | -1.5 to+30V |
| Shutdown Input Voltage | -0.3 to +30V |
| Error Comparator Output | -0.3 to +30V |

## PIN CONFIGURATION




8-Pin Plastic (Top View)




TO-92 (Bottom View)

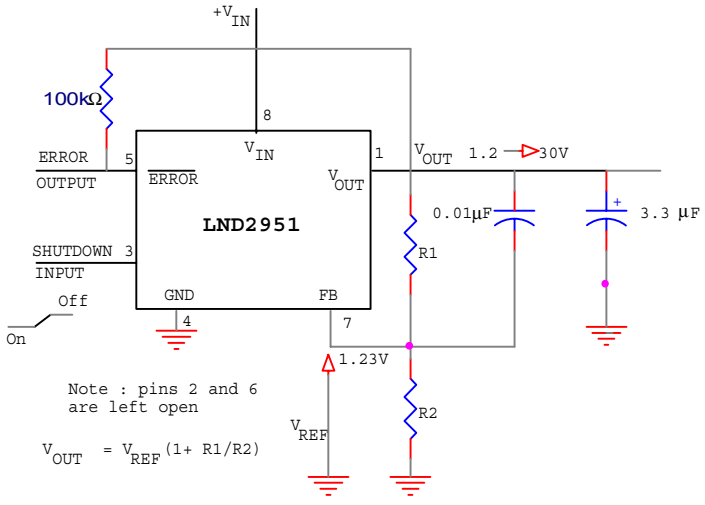



Figure 1: Adjustable Regulator

## ELECTRICAL CHARACTERISTICS ($T_A$=25 ºC, $V_{IN}$=15V Unless otherwise noted)

| PARAMETER | CONDITIONS (note 2) | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|
| Output Voltage | -25ºC ≤$T_j$ ≤85ºC<br>Full Operating Temperature | 0.985 \|Vo\|<br>0.98 \|Vo\| | $V_O$ | 1.015 \|Vo\|<br>1.02 \|Vo\| | V |
| Output Voltage | 100µA ≤$I_L$ ≤100mA, $T_J$ ≤ $T_{JMAX}$ | 0.976 \|Vo\| | $V_O$ | 1.024 \|Vo\| | |
| Output Voltage Temperature Coefficient | (note 1) | | 50 | 150 | ppm/ºC |
| Line Regulation(Note 3) | $V_O$+1V≤$V_{IN}$ ≤30V(Note 4) | | 0.04 | 0.4 | % |
| Load Regulation( Note3) | 100µA ≤$I_L$ ≤100mA | | 0.1 | 0.3 | % |
| Dropout Voltage(Note 5) | $I_{L=}$ 100µA<br>$I_{L=}$ 100mA | | 50<br>380 | 80<br>450 | mV |
| Ground Current | $I_{L=}$ 100µA<br>$I_{L=}$ 100mA | | 75<br>8 | 120<br>12 | µA<br>mA |
| Dropout Ground Current | $V_{IN}$ =$V_0$ =-0.5V,$I_L$ =100µA | | 110 | 170 | µA |
| Current Limit | $V_{out}$=0 | | 160 | 200 | mA |
| Thermal regulation | | | 0.05 | 0.2 | %/W |
| Output Noise,10Hz to 100KHz | $C_L$= 1µF<br>$C_{L=}$200µF<br>$C_{L=}$ 3.3µF<br>(Bypass=0.01µF pins 7 to 1 (LND2951-XX)) | | 430<br>160<br>100 | | µV rms |
| **8-PIN Versions Only** | | | | | |
| Reference Voltage | | 1.21 | 1.235 | 1.26 | V |
| Reference Voltage | Over temperature(Note 6) | 1.185 | | 1.285 | |
| Feedback Pin Bias Current | | | 20 | 40 | nA |
| Reference Voltage Temperature Coefficient | (note 7) | | 50 | | ppm/ºC |
| Feedback Pin Bias Current Temperature Coefficient | | | 0.1 | | nA/ºC |
| **Error Comparator** | | | | | |
| Output Leakage Current | Voh=30V | | 0.01 | 1.0 | µA |
| Output Low Voltage | Vin=4.5V,$I_{OL}$=400µA | | 150 | 250 | mV |
| Upper Threshold Voltage | (note 8) | 40 | 60 | | |
| Lower Threshold Voltage | (note 8) | | 75 | 95 | |
| Hysteresis | (note 8) | | 15 | | |
| **Shutdown Input** | | | | | |
| Input Logic Voltage | Low(Regulator ON)<br>High (Regulator OFF) | <br>2 | 1.3 | 0.7 | V |
| Shut down pin Input Current | $V_s$= 2.4V<br>$V_s$=30V | | 30<br>450 | 50<br>600 | µA |
| Regulator Output current in Shutdown | (Note 9) | | | | |
| | $V_{out}$=5.0V | | 3 | 10 | |
| | 3.3V≤$V_{out}$<5.0V | | | 20 | |
| | 2.0V≤$V_{out}$<3.3V | | | 30 | |

Note 1: Output or reference voltage temperature coefficients is defined as the worst case voltage change divided by the total temperature range.
Note 2: Unless otherwise specified all limits guaranteed for $T_j$ =25ºC, $V_{in}$=$V_o$ +1V,$I_L$=100µAand $C_L$ =1µF. Additional conditions for the 8 pin versions are feedback tied to –XX V tap and output tied to output sense($V_{out}$ =XX V) and V shutdown ≤0.8 V.
Note 3: Regulations is measured at constant junction temperature, using pulse testing with a low duty cycle. Changes in output voltage due to heating effects are covered under the specification for thermal regulation.
Note 4: Line regulation for LND2951-xx is tested at 150ºCfor $I_L$=1mA. For $I_L$ =100µA and Tj=125ºC, line regulation is guaranteed by design to 0.2%. See typical performance characteristics for line regulation verse temperature and load current.
Note 5: Dropout voltage is defined as the input to output differential at which the output voltage drops 100mV below its nominal value measured at 1V differential. At very low values of programmed output voltage, the minimum input supply voltage of 2V(2.3V over temperature) must be taken into account.
Note 6: $V_{ref} \leq V_{out} \leq$(Vin-1V), 2.3V ≤Vin ≤ 30V,100µA≤$I_L$≤ 100mA,$T_J \leq T_{JMAX}$
Note 7: Output or reference voltage temperature coefficient is defined as the worst case voltage change divided by the total temperature range.
Note 8: Comparator thresholds are expressed in terms of a voltage differential at the feedback terminal below the nominal reference voltage measured at $V_O$ +1V input. To express these thresholds in terms of output voltage change, multiply by the error amplifier gain =$V_{out}/V_{ref}$=(R1+R2)/R2. For example, at a programmed output voltage of 5V, the error output is guaranteed to go low when the output drops by 95mVx5V/1.235V=384mV. Thresholds remain constant as a percent of $V_{out}$ as $V_{out}$ is varied, with the dropout warning occurring at typically 5% below nominal, 7.5% guaranteed.
Note 9: $V_{shutdown} \geq$ 2V,Vin ≤30V,$V_{out}$ =0, Feed-back pin tied to –XX V tap.

## APPLICATION HINTS

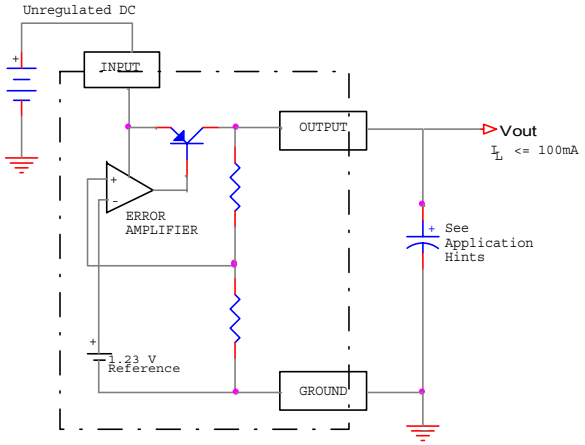
### External Capacitors

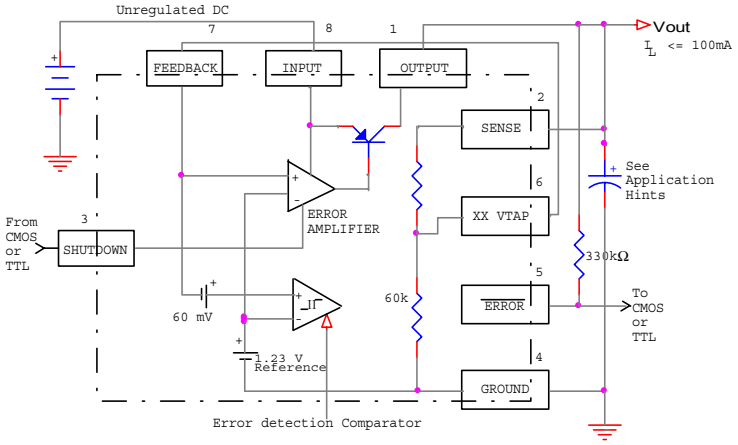
A 1.0 µF (or greater ) capacitor is required between the output and the ground for stability at output voltages of 5V or more. At lower output voltages, more capacitance is required. 2.2 µF or more is recommended for 3 V and 3.3 V versions.

### Programming the Output Voltage

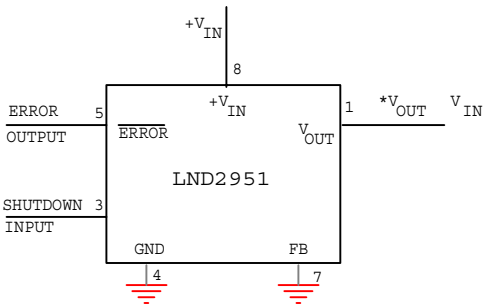
The LND2951 may be pin-strapped for the nominal fixed output voltage. Alternatively it may be programmed for any output voltage between 1.24 V and 29 V depending upon the requirements.

## BLOCK DIAGRAM AND TYPICAL APPLICATIONS



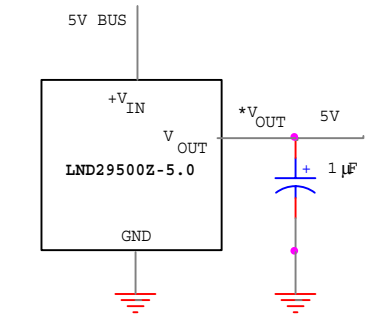



## TYPICAL APPLICATIONS



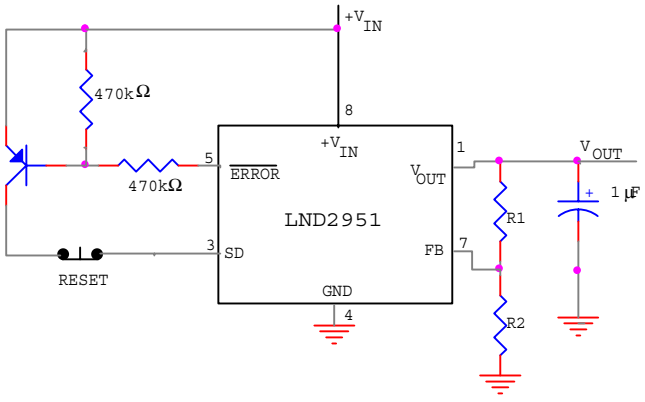

*Minimum input-output voltage ranges from 40mV to 400mV, depending on load current. Current limit is typically 160mA.

Wide Input Voltage Range Current Limiter

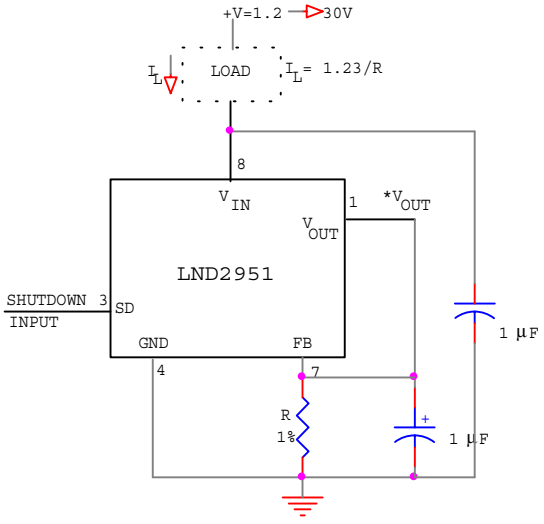



*Minimum input-output voltage ranges from 40mV to 400mV, depending on load current. Current limit is typically 160mA.

5V Current Limiter




Latch Off When Error Flag Occurs




Low Drift Current Source