



LP2950/2951

LINEAR INTEGRATED CIRCUIT

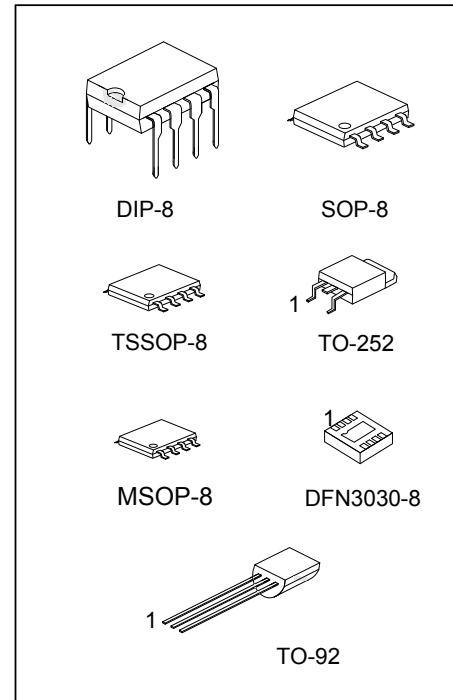
100 mA LOW-DROPOUT VOLTAGE REGULATOR

DESCRIPTION

The UTC **LP2950/2951** are monolithic integrated voltage regulators with low dropout voltage, and low quiescent current. It includes many features that suitable for different applications.

FEATURES

- * Fixed output versions, 2.5V, 3.0V, 3.3V, 3.6V and 5.0V, are available
- * High accuracy output voltage
- * Extremely low quiescent current and dropout voltage
- * Extremely tight load and line regulation
- * Current and thermal limiting
- * Very low temperature coefficient
- * Logic controlled shutdown and err flog available for 8 pin package
- * Output voltage programmable for **LP2951**



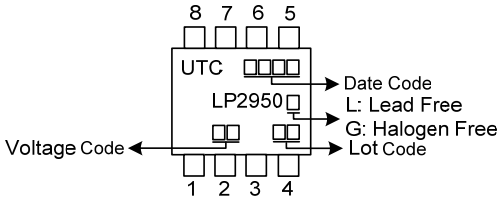
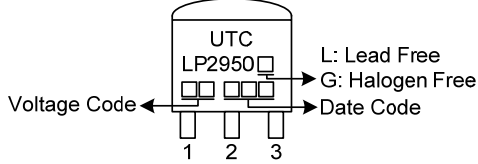
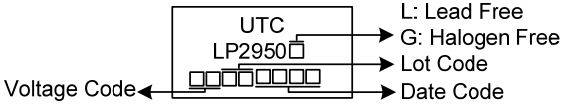
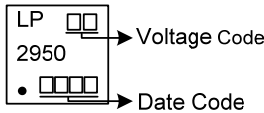
ORDERING INFORMATION

| Ordering Number | | Package | Packing |
|-----------------------|-----------------------|-----------|-----------|
| Lead Free | Halogen Free | | |
| LP2950L-xx-D08-T | LP2950G-xx-D08-T | DIP-8 | Tube |
| LP2950L-xx-S08-R | LP2950G-xx-S08-R | SOP-8 | Tape Reel |
| LP2950L-xx-SM1-R | LP2950G-xx-SM1-R | MSOP-8 | Tape Reel |
| LP2950L-xx-T92-B | LP2950G-xx-T92-B | TO-92 | Tape Box |
| LP2950L-xx-T92-K | LP2950G-xx-T92-K | TO-92 | Bulk |
| LP2950L-xx-TN3-R | LP2950G-xx-TN3-R | TO-252 | Tape Reel |
| LP2950L-xx-K08-3030-R | LP2950G-xx-K08-3030-R | DFN3030-8 | Tape Reel |
| LP2951L-xx-D08-T | LP2951G-xx-D08-T | DIP-8 | Tube |
| LP2951L-xx-S08-R | LP2951G-xx-S08-R | SOP-8 | Tape Reel |
| LP2951L-xx-SM1-R | LP2951G-xx-SM1-R | MSOP-8 | Tape Reel |
| LP2951L-xx-P08-R | LP2951G-xx-P08-R | TSSOP-8 | Tape Reel |
| LP2951L-xx-K08-3030-R | LP2951G-xx-K08-3030-R | DFN3030-8 | Tape Reel |

Note: Pin Assignment: I: V_{IN} O: V_{OUT} G: GND

| | |
|--|--|
| <p>LP2950G-xx-D08-T</p> <p>(1)Packing Type (2)Package Type (3)Output Voltage Code (4)Green Package</p> | <p>(1) T: Tube, B: Tape Box, K: Bulk, R: Tape Reel (2) D08: DIP-8, S08: SOP-8, SM1: MSOP-8, P08: TSSOP-8, TN3: TO-252, T92: TO-92, K08-3030: DFN3030-8 (3) xx: 25: 2.5V, 30: 3.0V... 50: 5.0V Blank: 5.0V (For LP2951) (4) G: Halogen Free and Lead Free, L: Lead Free</p> |
|--|--|

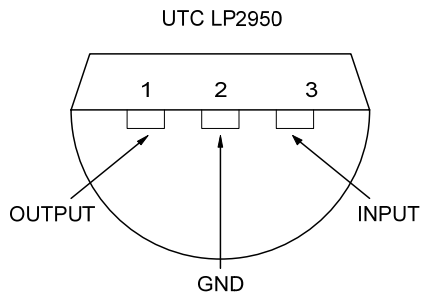
■ MARKING INFORMATION (For LP2950)

| PACKAGE | VOLTAGE CODE | MARKING |
|--------------------------|--|--|
| DIP-8 SOP-8 MSOP-8 | 25: 2.5V 30: 3.0V 33: 3.3V 36: 3.6V 50: 5.0V |  <p>Diagram showing marking on an 8-pin package. Pin 1 is labeled '1', pin 2 '2', pin 3 '3', pin 4 '4', pin 5 '5', pin 6 '6', pin 7 '7', pin 8 '8'. Markings include 'UTC' at the top, 'LP2950' in the center, and a 'Voltage Code' on the left. On the right, there are three groups of markings: 'Date Code' (two digits), 'L: Lead Free' (one digit), and 'G: Halogen Free' (one digit), with a 'Lot Code' (two digits) below them.</p> |
| TO-92 | |  <p>Diagram showing marking on a TO-92 package. Pins are labeled '1', '2', '3'. Markings include 'UTC' at the top, 'LP2950' in the center, and a 'Voltage Code' on the left. On the right, there are two groups of markings: 'L: Lead Free' (one digit) and 'G: Halogen Free' (one digit), with 'Date Code' (two digits) below them.</p> |
| TO-252 | |  <p>Diagram showing marking on a TO-252 package. Markings include 'UTC' at the top, 'LP2950' in the center, and a 'Voltage Code' on the left. On the right, there are three groups of markings: 'L: Lead Free' (one digit), 'G: Halogen Free' (one digit), 'Lot Code' (two digits), and 'Date Code' (two digits) at the bottom.</p> |
| DFN3030-8 | |  <p>Diagram showing marking on a DFN3030-8 package. Markings include 'LP' and '2950' on the top, and a 'Voltage Code' on the right. Below, there is a 'Date Code' (two digits) with a small dot to its left.</p> |

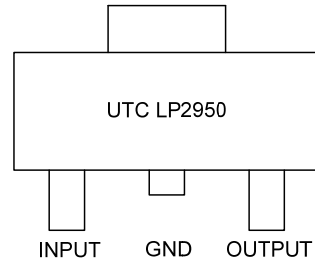
■ MARKING INFORMATION (For LP2951)

| PACKAGE | VOLTAGE CODE | MARKING |
|-----------------|----------------------|---------|
| DIP-8 | Blank: 5.0V | |
| SOP-8 | | |
| MSOP-8 | | |
| TSSOP-8 | | |
| DFN3030-8 | | |
| SOP-8 MSOP-8 | 30: 3.0V 33: 3.3V | |

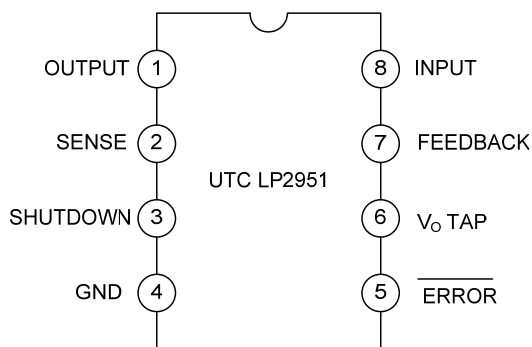
■ PIN CONFIGURATIONS



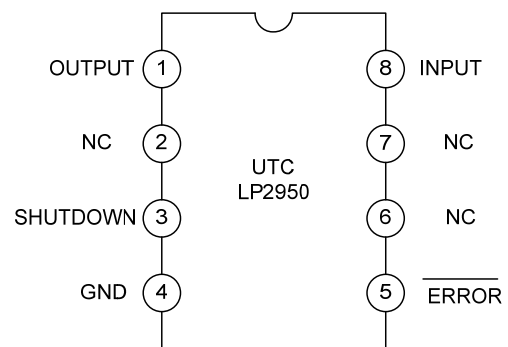
TO-92 Plastic Package Bottom View



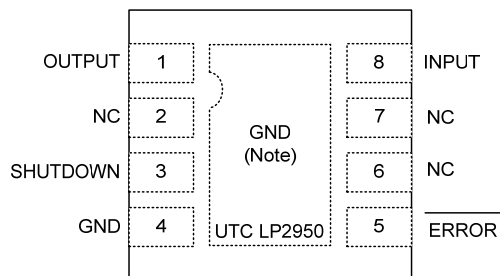
TO-252 Package



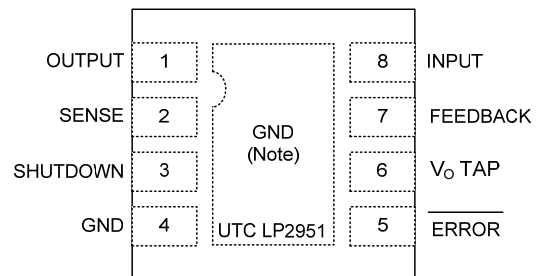
DIP-8, SOP-8, MSOP-8 or TSSOP-8 Package For UTC LP2951



DIP-8, SOP-8 or MSOP-8 Package For UTC LP2950



DFN3030-8 Plastic Package Top View



DFN3030-8 Plastic Package Top View

Note: Connect exposed pad to GND.

■ ABSOLUTE MAXIMUM RATINGS

| PARAMETER | SYMBOL | RATINGS | UNIT |
|--------------------------------|------------|--------------------|------|
| Supply Voltage | V_{CC} | -0.3 ~ +30 | V |
| Feedback Voltage | V_{FB} | -1.5 ~ +30 | V |
| Shutdown Voltage | V_{SHDN} | -0.3 ~ +30 | V |
| Power Dissipation | P_D | Internally Limited | W |
| Operation Junction Temperature | T_J | -40 ~ +125 | °C |
| Storage Temperature | T_{STG} | -65 ~ +150 | °C |

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.

■ THERMAL DATA

| PARAMETER | SYMBOL | RATING | UNIT |
|---------------------|-------------|-----------|------|
| Junction-to-Ambient | TO-92 | 180 | °C/W |
| | TO-252 | 92 | °C/W |
| | TSSOP-8 | 150 | °C/W |
| | MSOP-8 | 190 | °C/W |
| | SOP-8 | 143 | °C/W |
| | DIP-8 | 105 | °C/W |
| | DFN3030-8 | 64 (Note) | °C/W |
| Junction-to-Case | TO-92 | 83 | °C/W |
| | TO-252 | 6 | °C/W |
| | TSSOP-8 | 50 | °C/W |
| | MSOP-8 | 55 | °C/W |
| | SOP-8/DIP-8 | 45 | °C/W |
| | DFN3030-8 | 9 (Note) | °C/W |

Note: The data tested by surface mounted on a 2 inch² FR-4 board with 2OZ copper.

■ ELECTRICAL CHARACTERISTICS ($T_J=25^\circ\text{C}$, $V_{IN}=6\text{V}$, $I_L=100\mu\text{A}$, $C_L=1\mu\text{F}$, unless otherwise specified.)

For All Version:

| PARAMETER | SYMBOL | TEST CONDITION | MIN | TYP | MAX | UNIT |
|---|------------------|---|----------------------|-----------|----------------------|---------------|
| Output Voltage | V_{OUT} | $T_J=25^\circ\text{C}$ (Note 1) | $V_{OUT}\times 0.98$ | V_{OUT} | $V_{OUT}\times 1.02$ | V |
| Output Voltage | V_{OUT} | $100\mu\text{A}\leq I_L\leq 100\text{mA}$, $T_J\leq T_J(\text{max})$ | $V_{OUT}\times 0.98$ | V_{OUT} | $V_{OUT}\times 1.02$ | V |
| Output Voltage Temperature Coefficient | $T_C V_O$ | | 20 | | 100 | ppm/°C |
| Line Regulation | ΔV_{OUT} | $6\text{V}\leq V_{IN}\leq 30\text{V}$ | 0.03 | 0.1 | 0.2 | % |
| Load Regulation | ΔV_{OUT} | $100\mu\text{A}\leq I_L\leq 100\text{mA}$ | 0.04 | 0.1 | 0.2 | % |
| Dropout Voltage | V_D | $I_L=100\mu\text{A}$ | 50 | 80 | 150 | mV |
| | | $I_L=100\text{mA}$ (Note 2) | 380 | 450 | 600 | mV |
| Ground Current | I_G | $I_L=100\mu\text{A}$ | | 120 | 140 | μA |
| | | $I_L=100\text{mA}$ | | 12 | 14 | mA |
| Dropout Ground Current | | $V_{IN}=(V_{ONOM}-0.5)\text{V}$, $I_L=100\mu\text{A}$ | | 170 | 200 | μA |
| Current Limit | I_{LIMIT} | $V_{OUT}=0$ | 130 | 190 | 250 | mA |
| Output Noise (10Hz ~ 100KHz) (Bypass=0.01 μF pins 7 to 1 (LP2951)) | eN | $C_L=1\mu\text{F}$ | | | 430 | μV |
| | | $C_L=200\mu\text{F}$ | | | 160 | μV |
| | | $C_L=3.3\mu\text{F}$ | | | 100 | μV |

■ ELECTRICAL CHARACTERISTICS(Cont.)

For UTC LP2950 8-Pin Version Only

| PARAMETER | SYMBOL | TEST CONDITION | MIN | TYP | MAX | UNIT |
|-----------------------------------|---------------|---|---------------|-----|------|---------|
| Error Comparator | | | | | | |
| Output Leakage Current | $I_{O(LEAK)}$ | $V_{OH}=30V$ | | | 1 | μA |
| Output Low Voltage | V_{OL} | $V_{IN}=(V_{O(NOM)} - 0.5)V, I_{OL}=400\mu A$ | | | 280 | mV |
| Threshold Voltage | Upper | V_{THU} (Note 3) | 3.2 | | | %VO |
| | Lower | V_{THL} (Note 3) | | | 7.6 | %VO |
| Hysteresis | V_{HYS} | (Note 3) | | 15 | | mV |
| Shutdown Input | | | | | | |
| Input Logic Voltage | Low | V_{IL} | Regulator ON | | 0.70 | V |
| | High | V_{IH} | Regulator OFF | 2.0 | | V |
| Shutdown Pin Input Current | I_{SHDN} | $V_{SHDN}=2.4V$ | | 30 | 50 | μA |
| | | $V_{SHDN}=30V$ | | 450 | 600 | μA |
| Regulator Output Current Shutdown | I_{DFF} | $V_{SHDN} \geq 2V, V_{IN} \leq 30V, V_{OUT}=0$ Feedback pin tied to V_O Tap. | | 3 | 10 | μA |

For UTC LP2951 8-Pin Version Only

| PARAMETER | SYMBOL | TEST CONDITION | MIN | TYP | MAX | UNIT |
|---|---------------|---|---------------|-------|------|------------------|
| Reference Voltage | V_{REF} | | 1.22 | 1.235 | 1.25 | V |
| Reference Voltage | V_{REF} | Over temperature(Note 4) | 1.19 | | 1.27 | V |
| Feedback pin Bias Current | I_{FB} | | | 20 | 40 | nA |
| Reference Voltage Temperature Coefficient | $V_{REF(TC)}$ | | | 50 | | ppm/ $^{\circ}C$ |
| Feedback Bias Current Temperature Coefficient | $I_{FB(TC)}$ | | | 0.1 | | nA/ $^{\circ}C$ |
| Error Comparator | | | | | | |
| Output Leakage Current | $I_{O(LEAK)}$ | $V_{OH}=30V$ | | | 1 | μA |
| Output Low Voltage | V_{OL} | $V_{IN}=(V_{O(NOM)} - 0.5)V, I_{OL}=400\mu A$ | | | 250 | mV |
| Threshold Voltage | Upper | V_{THU} (Note 3) | 3.2 | | | %VO |
| | Lower | V_{THL} (Note 3) | | | 7.6 | %VO |
| Hysteresis | V_{HYS} | (Note 3) | | 15 | | mV |
| Shutdown Input | | | | | | |
| Input Logic Voltage | Low | V_{IL} | Regulator ON | | 0.70 | V |
| | High | V_{IH} | Regulator OFF | 2.0 | | V |
| Shutdown Pin Input Current | I_{SHDN} | $V_{SHDN}=2.4V$ | | 30 | 50 | μA |
| | | $V_{SHDN}=30V$ | | 450 | 600 | μA |
| Regulator Output Current Shutdown | I_{DFF} | $V_{SHDN} \geq 2V, V_{IN} \leq 30V, V_{OUT}=0$ Feedback pin tied to V_O Tap. | | 3 | 10 | μA |

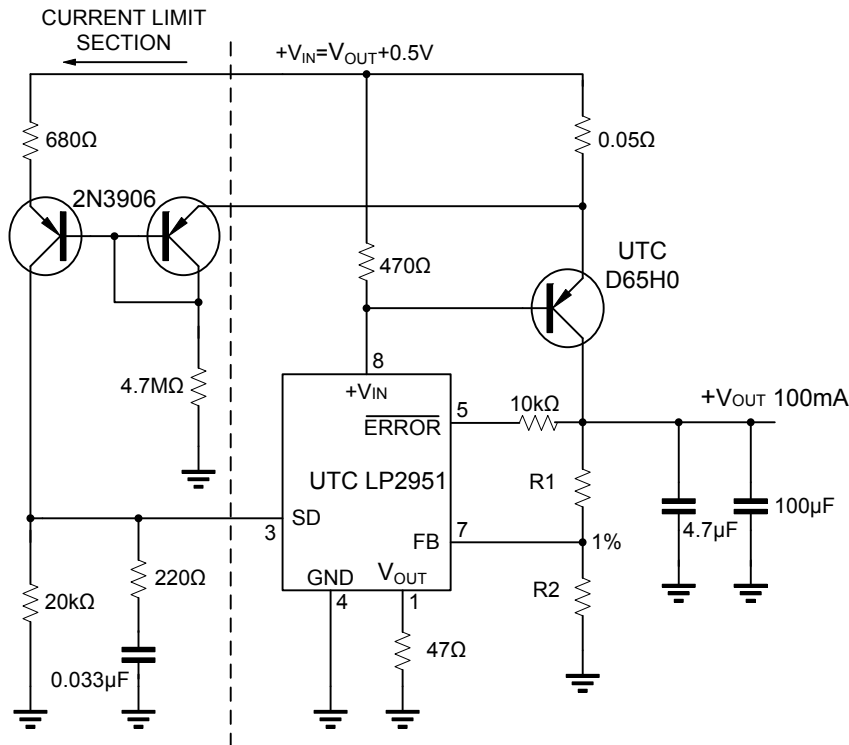
Note: 1. Additional conditions for 8-pin versions are FB pin tied to V_O Tap, Output tied to Sense ($V_{OUT}=3.3V$ or $5V$) and $V_{SHDN} \leq 0.8V$.

2. 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.

3. Comparator thresholds are expressed in terms of percentage value of voltage output.

4. $V_{REF} \leq V_{OUT} \leq (V_{IN} - 1V)$, $2.3V \leq V_{IN} \leq 30V$, $100\mu A \leq I_L \leq 100mA$, $T_J \leq T_{J(MAX)}$

■ TYPICAL APPLICATION CIRCUIT
100 Ampere Low Dropout Regulator



$V_{OUT} = 1.23V \times (1 + R1/R2)$
 For V_O TAP output use internal resistors. Wire pin 6 to 7 and wire pin 2 to $+V_{OUT}$

Fig.1

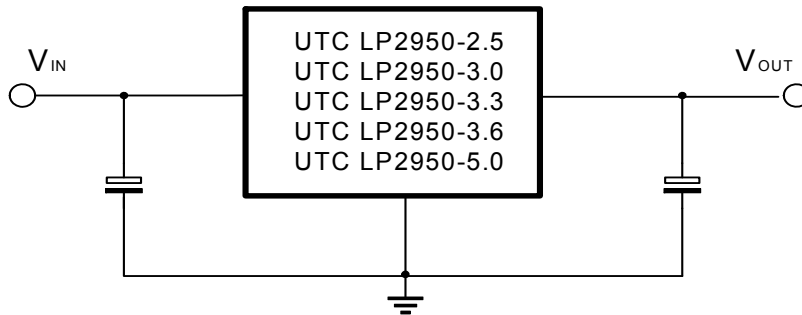


Fig.2

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