



# LP2950/2951

## LINEAR INTEGRATED CIRCUIT

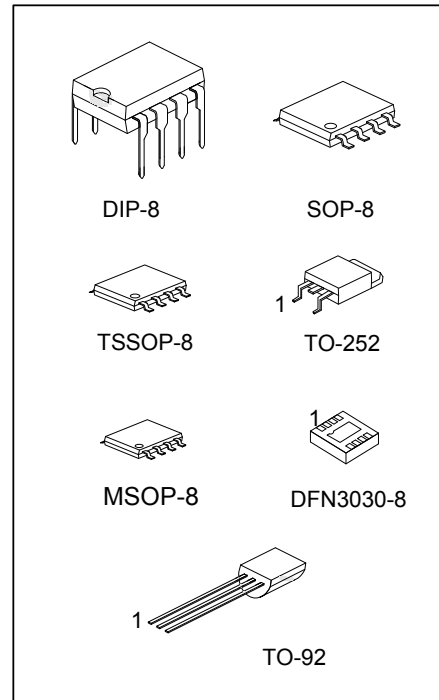
### 100 mA LOW-DROPOUT VOLTAGE REGULATOR

■ 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



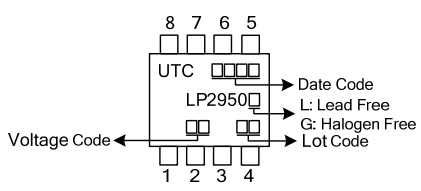
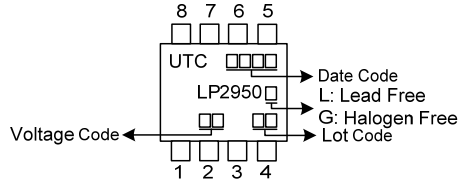
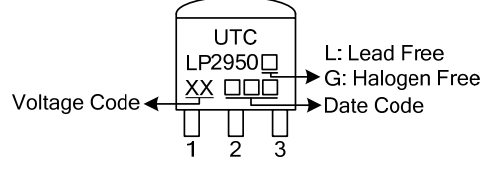
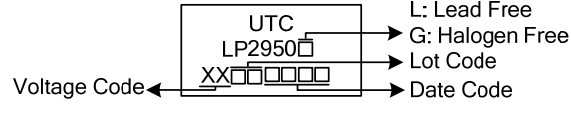
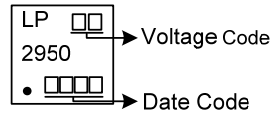
■ ORDERING INFORMATION

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-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-D08-T	LP2951G-D08-T	DIP-8	Tube
LP2951L-S08-R	LP2951G-S08-R	SOP-8	Tape Reel
LP2951L-SM1-R	LP2951G-SM1-R	MSOP-8	Tape Reel
LP2951L-P08-R	LP2951G-P08-R	TSSOP-8	Tape Reel
LP2951L-K08-3030-R	LP2951G-K08-3030-R	DFN3030-8	Tape Reel

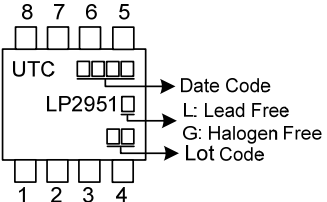
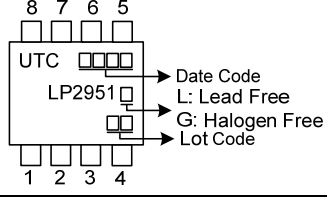
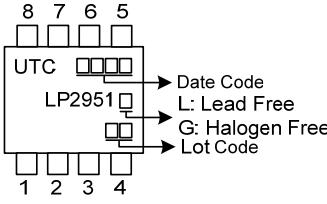
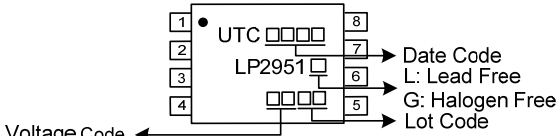
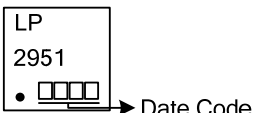
Note: Pin Assignment: I:  $V_{IN}$  O:  $V_{OUT}$  G: GND

<p>LP2950G-xx-D08-T</p>	<p>(1) 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: refer to Output Voltage Code                  (4) G: Halogen Free and Lead Free, L: Lead Free</p>
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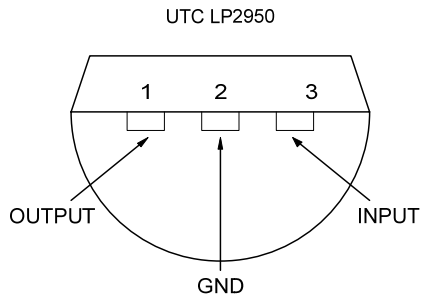
■ MARKING INFORMATION (For LP2950)

PACKAGE	VOLTAGE CODE	MARKING
DIP-8	25: 2.5V 30: 3.0V 33: 3.3V 36: 3.6V 50: 5.0V	
SOP-8		
TO-92		
TO-252		
DFN3030-8		

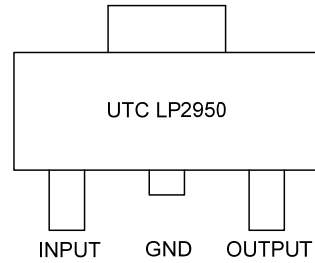
■ MARKING INFORMATION (For LP2951)

PACKAGE	MARKING
DIP-8	 <p>8 7 6 5 UTC □□□□ → Date Code LP2951 □ → L: Lead Free □ → G: Halogen Free □ → Lot Code 1 2 3 4</p>
SOP-8	 <p>8 7 6 5 UTC □□□□ → Date Code LP2951 □ → L: Lead Free □ → G: Halogen Free □ → Lot Code 1 2 3 4</p>
MSOP-8	 <p>8 7 6 5 UTC □□□□ → Date Code LP2951 □ → L: Lead Free □ → G: Halogen Free □ → Lot Code 1 2 3 4</p>
TSSOP-8	 <p>1 2 3 4 5 6 7 8 UTC □□□□ → Date Code LP2951 □ → L: Lead Free □ → G: Halogen Free □ → Lot Code Voltage Code ← □□□□</p>
DFN3030-8	 <p>LP 2951 • □□□□ → Date Code</p>

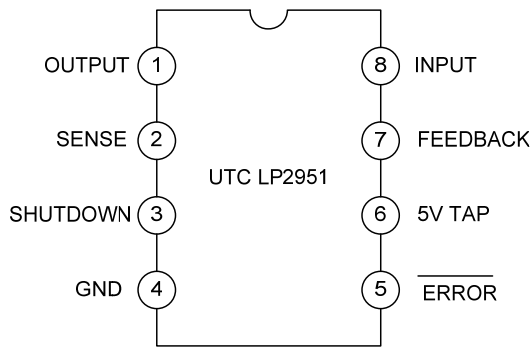
## ■ PIN CONFIGURATIONS



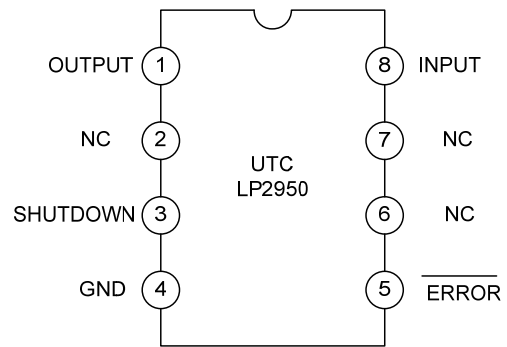
TO-92 Plastic Package Bottom View



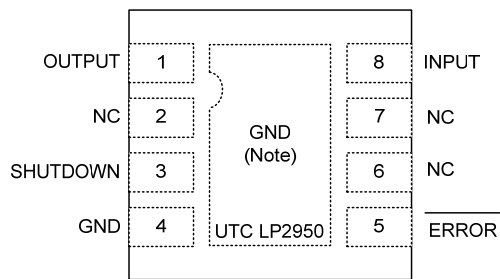
TO-252 Package



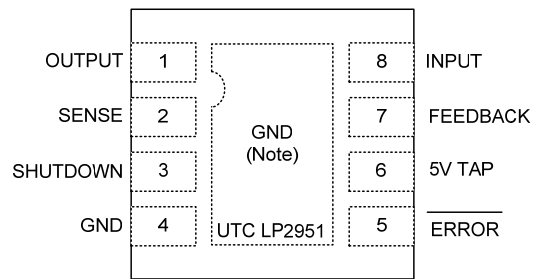
DIP-8, SOP-8 or TSSOP-8 Package For UTC LP2951



DIP-8, SOP-8 Package For UTC LP2950



DFN3030-8 Plastic Package Top View

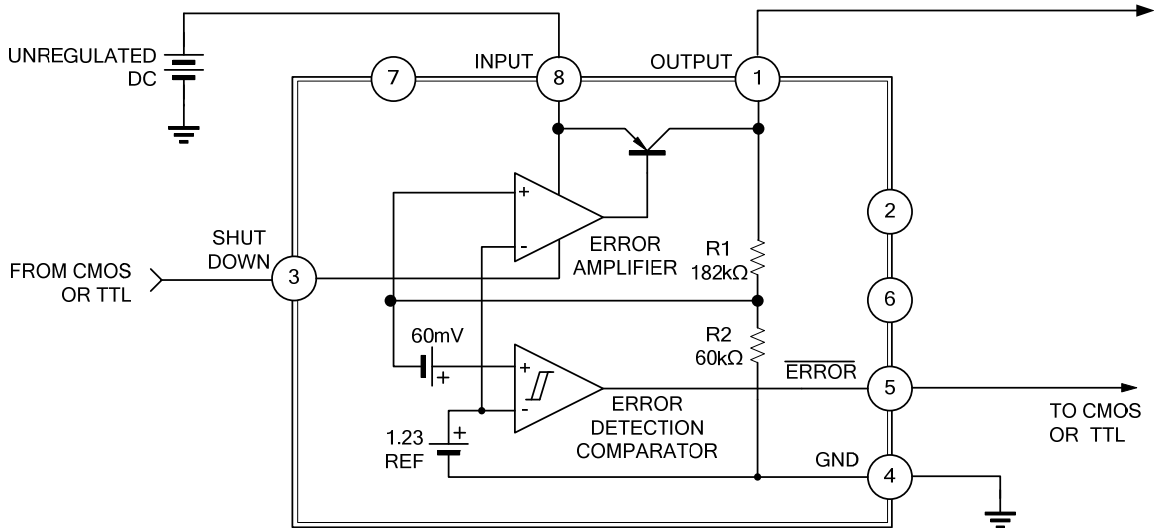


DFN3030-8 Plastic Package Top View

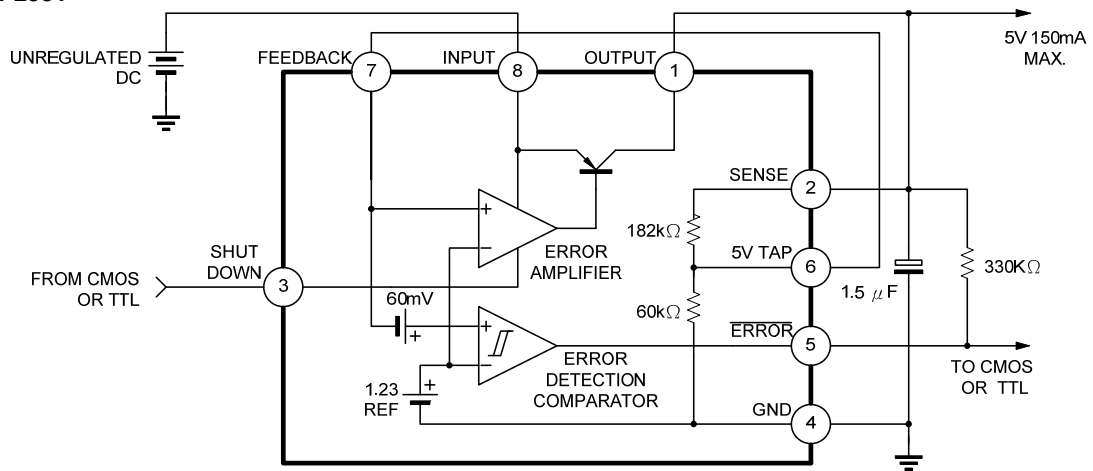
Note: Connect exposed pad to GND.

## ■ BLOCK DIAGRAM

### FOR LP2950



### FOR LP2951



### ■ 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	
	TSSOP-8	150	
	MSOP-8	190	
	SOP-8	143	
	DIP-8	105	
	DFN3030-8	64 (Note)	
Junction-to-Case	TO-92	83	°C/W
	TO-252	6	
	TSSOP-8	50	
	MSOP-8	55	
	SOP-8/DIP-8	45	
	DFN3030-8	9 (Note)	

Note: The data tested by surface mounted on a 2 inch<sup>2</sup> 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	$TcV_o$		20		100	ppm/°C
Line Regulation	$\Delta V_{OUT}$	$6\text{V}\leq V_{IN}\leq 30\text{V}$	0.03	0.1	0.2	%
Load Regulation	$\Delta V_{OUT}$	$100\mu\text{A}\leq I_L\leq 100\text{mA}$	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	
Ground Current	$I_G$	$I_L=100\mu\text{A}$		120	140	$\mu\text{A}$
		$I_L=100\text{mA}$		12	14	mA
Dropout Ground Current		$V_{IN}=4.5\text{V}$ , $I_L=100\mu\text{A}$		170	200	$\mu\text{A}$
Current Limit	$I_{LIMIT}$	$V_{OUT}=0$	130	190	250	mA
Output Noise (10Hz ~ 100KHz) (Bypass=0.01 $\mu\text{F}$ pins 7 to 1 (LP2951))	eN	$C_L=1\mu\text{F}$			430	$\mu\text{V}$
		$C_L=200\mu\text{F}$			160	
		$C_L=3.3\mu\text{F}$			100	

### ■ ELECTRICAL CHARACTERISTICS(Cont.)

#### For UTC LP2950 8-Pin Version Only

PARAMETER	SYMBOL	TEST CONDITION	MIN	TYP	MAX	UNIT
<b>Error Comparator</b>						
Output Leakage Current	$I_{O(LEAK)}$	$V_{OH}=30V$			1	$\mu A$
Output Low Voltage	$V_{OL}$	$V_{IN}=4.5V, I_{OL}=400\mu A$			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
<b>Shutdown Input</b>						
Input Logic Voltage	Low	$V_{IL}$	Regulator ON		0.70	V
	High	$V_{IH}$	Regulator OFF	2.0		
Shutdown Pin Input Current	$I_{SHDN}$	$V_{SHDN}=2.4V$		30	50	$\mu A$
		$V_{SHDN}=30V$		450	600	$\mu A$
Regulator Output Current Shutdown	$I_{DFF}$	$V_{SHDN} \geq 2V, V_{IN} \leq 30V, V_{OUT}=0$ Feedback pin tied to 5V Tap.		3	10	$\mu A$

#### 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/ $^{\circ}C$
<b>Error Comparator</b>						
Output Leakage Current	$I_{O(LEAK)}$	$V_{OH}=30V$			1	$\mu A$
Output Low Voltage	$V_{OL}$	$V_{IN}=4.5V, I_{OL}=400\mu A$			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
<b>Shutdown Input</b>						
Input Logic Voltage	Low	$V_{IL}$	Regulator ON		0.70	V
	High	$V_{IH}$	Regulator OFF	2.0		
Shutdown Pin Input Current	$I_{SHDN}$	$V_{SHDN}=2.4V$		30	50	$\mu A$
		$V_{SHDN}=30V$		450	600	$\mu A$
Regulator Output Current Shutdown	$I_{DFF}$	$V_{SHDN} \geq 2V, V_{IN} \leq 30V, V_{OUT}=0$ Feedback pin tied to 5V Tap.		3	10	$\mu A$

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

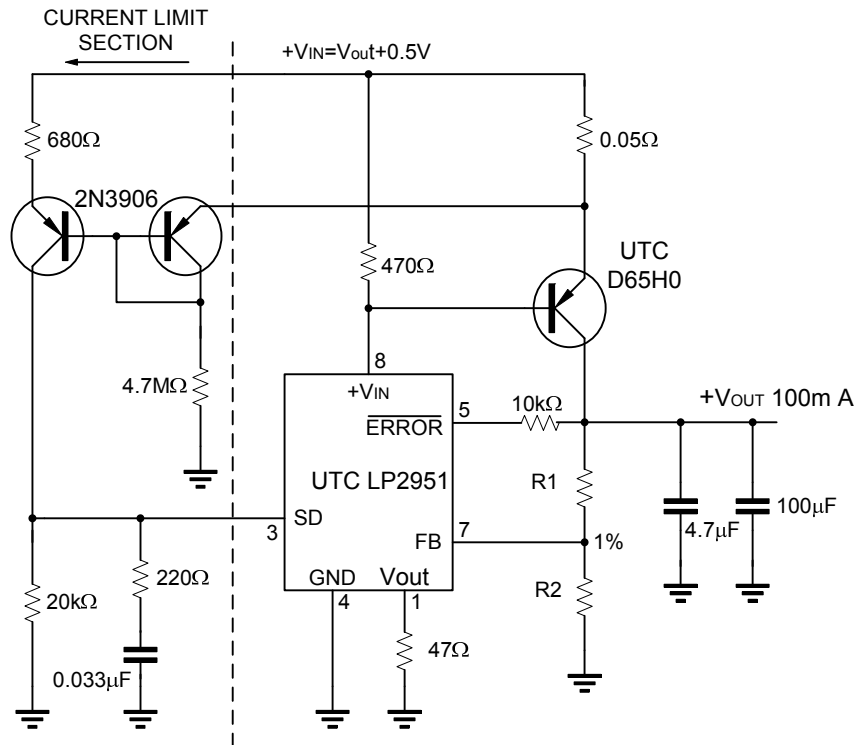
2. Dropout Voltage is defined as the input to output differential at which the output voltage drops 100mV below its nominal value measured at 1V differential.

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

10 Ampere Low Dropout Regulator



$$V_{OUT} = 1.23V * (1 + R1/R2)$$

For 5V output use internal resistors. Wire pin 6 to 7 and wire pin 2 to +Vout

Fig.1

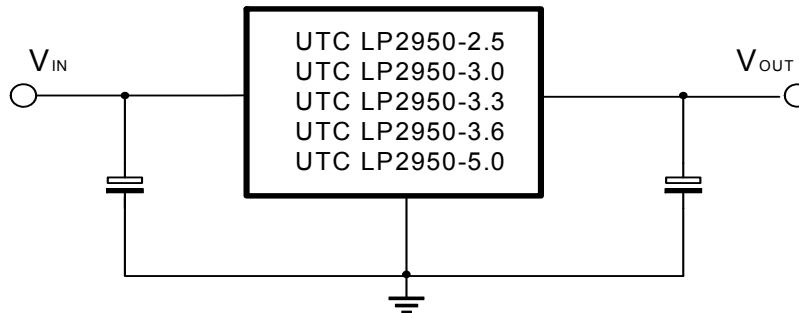


Fig.2

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