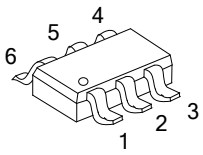
SINGLE LOW-POWER 1.8V RAIL TO RAIL INPUT AND OUTPUT OPERATIONAL AMPLIFIERS WITH SHUTDOWN



SOT-26

■ DESCRIPTION

UTC **LV981** is a low-voltage, low-power operational amplifier with shutdown function. UTC **LV981** has rail-to-rail input/output, and operates from 1.8V to 5V voltage. So it suits for low-voltage and portable applications. UTC **LV981** input common mode voltage extends 200mV beyond the supplies which enables user enhanced functionality beyond the supply voltage range. The output can swing rail-to-rail unloaded and within about 105mV from the rail with 600Ω load at 1.8V supply. UTC **LV981** can work at 1.8V, which makes it ideal for portable two-cell battery powered systems or single cell Li-Ion systems.

UTC **LV981** offers shutdown function so that can realize power saving. The device is in shutdown when the $\overline{SHDN}$ pin pull to low. The output is high impedance in shutdown.

UTC **LV981** show excellent speed-power ratio, when powering 1.8V supply, it performs 1.4MHz gain bandwidth product with low supply current 100μA.

■ FEATURES

* Ensured 1.8V, 2.7V, and 5V Specifications
* Output Swing:
  -600Ω Load: 80mV from Rail
  -2kΩ Load: 30mV from Rail
* V_{CMR}: 200mV Beyond Rails
* Supply Current : 100μA
* Maximum V_{OS}: 4mV

■ ORDERING INFORMATION

Ordering Number		Package	Packing
Lead Free	Halogen Free		
LV981L-AG6-R	LV981G-AG6-R	SOT-26	Tape Reel

LV981G-AG6-R
- (1)Packing Type
- (2)Package Type
- (3)Green Package

(1) R: Tape Reel
(2) AG6: SOT-26
(3) G: Halogen Free and Lead Free, L: Lead Free

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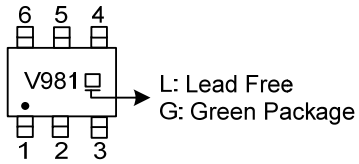
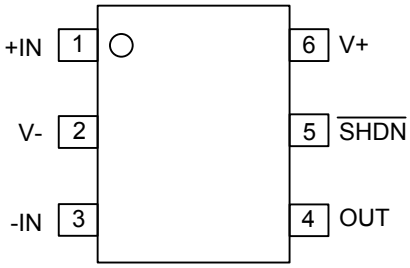
■ MARKING



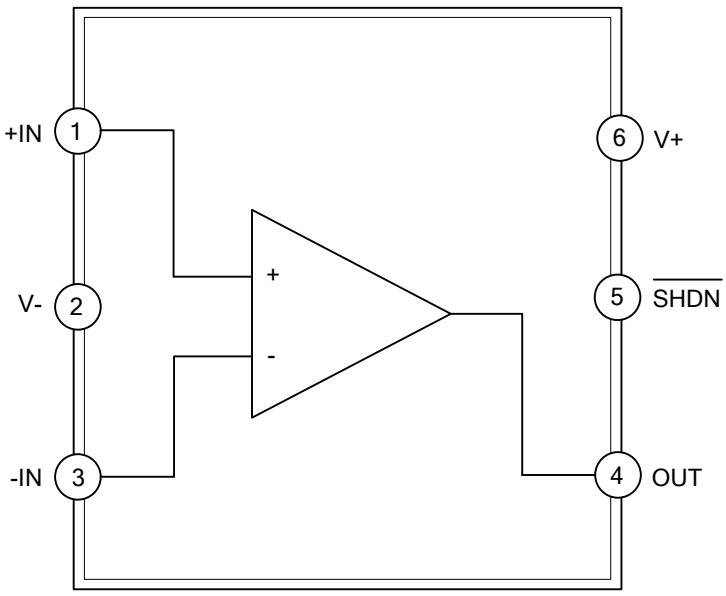
■ PIN CONFIGURATION



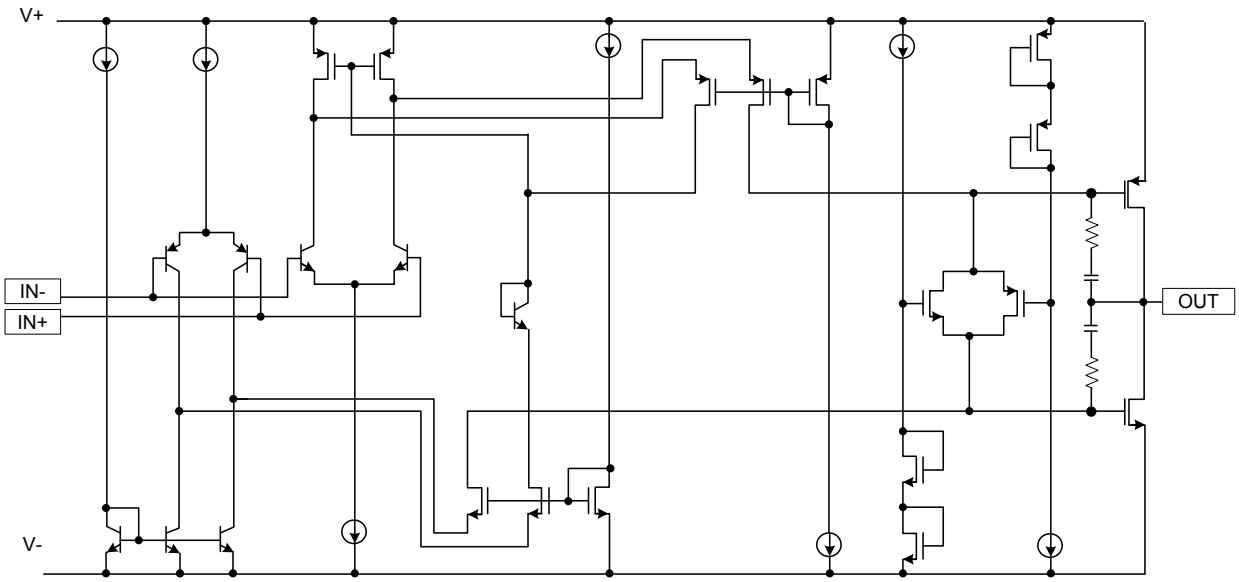
■ PIN DESCRIPTION

PIN NO.	PIN NAME	DESCRIPTION
1	+IN	Non-inverting input
2	V-	Negative power supply
3	-IN	Inverting input
4	OUT	Output
5	$\overline{\text{SHDN}}$	Shutdown input
6	V+	Positive power supply

■ BLOCK DIAGRAM



■ INTERNAL SIMPLE CIRCUIT(AMPLIFIERS SECTION)



■ ABSOLUTE MAXIMUM RATING over operating free-air temperature range (unless otherwise noted)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage (V^+ - V^-)		5.5	V
Differential Input Voltage	V_{ID}	±Supply voltage	
Voltage at Input/Output Pins		V^++ 0.3 ~ V^- - 0.3	V
Junction Temperature	T_J	+150	°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.

■ RECOMMENDED OPWRAING CONDITIONS

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V^+	1.8 ~ 5	V
Operating Free-Air Temperature	T_{OPR}	-40 ~ +125	°C

■ ELECTRICAL CHARACTERISTICS 1.8V

(T_J =25°C, V^+=1.8V, V^-=0V, $\overline{SHDN}$ connect to V^+, V_{CM} and V_O=V^+/2, R_L > 1MΩ, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Input Offset Voltage	V_{OS}			1	4	mV
Input Bias Current	I_B			15	35	nA
Input Offset Current	I_{OS}			13	25	nA
Supply Current	I_q			100	185	μA
		In Shutdown		0.156	1	μA
Common Mode Rejection Ratio	CMRR	0V≤V_{CM}≤0.6V, 1.4V≤V_{CM}≤1.8V	60	78		dB
		-0.2V ≤ V_{CM} ≤ 0V, 1.8V ≤ V_{CM} ≤ 2V	50	72		dB
Power Supply Rejection Ratio	PSRR	1.8V ≤V^+ ≤ 5V	75	100		dB
Input Common-Mode Voltage	CMVR	For CMRR Range ≥ 50dB	V^- - 0.2	-0.2		V
				2.1	V^+ + 0.2	V
Large Signal Voltage Gain	A_V	R_L=600Ω~0.9V, V_O=0.2V~1.6V, V_{CM}=0.5V	77	101		dB
		R_L=2kΩ~0.9V, V_O=0.2V~1.6V, V_{CM}=0.5V	80	105		dB
Output Swing	V_O	R_L=600Ω~0.9V, V_{IN}=100mV	1.65	1.72		V
		R_L=600Ω~0.9V, V_{IN}=-100mV		0.08	0.105	V
		R_L=2kΩ~0.9V, V_{IN}=100mV	1.75	1.77		V
		R_L=2kΩ~0.9V, V_{IN}=-100mV		0.025	0.035	V
Output Short Circuit Current	I_O	Sourcing, V_O=0V, V_{IN}=100mV	4	8		mA
		Sinking, V_O=1.8V, V_{IN}=-100mV	7	9		mA
Turn-on Time from Shutdown	T_{ON}			19		μs
Turn-on Voltage	V_{SHDN}			1		V
Turnoff Voltage				0.55		V
Slew Rate	SR			0.35		V/μs
Gain-Bandwidth Product	GBW			1.4		MHz
Phase Margin	Φ_m			67		°
Gain Margin	G_m			7		dB
Input-Referred Voltage Noise	e_n	f =10kHz, V_{CM}=0.5V		60		nV/$\sqrt{Hz}$
Input-Referred Current Noise	i_n	f =10kHz		0.08		pA/$\sqrt{Hz}$
Total Harmonic Distortion	THD	f=1kHz, A_V=+1, R_L=600Ω, V_{IN}=1V_{PP}		0.02		%

■ ELECTRICAL CHARACTERISTICS 2.7V

(T_J =25°C, V^+=2.7V, V^-=0V, $\overline{SHDN}$ connect to V^+, V_{CM} and V_O=V^+/2, R_L > 1MΩ, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Input Offset Voltage	V_{OS}			1	4	mV
Input Bias Current	I_B			15	35	nA
Input Offset Current	I_{OS}			8	25	nA
Supply Current	I_q			105	190	μA
		In Shutdown		0.06	1	μA
Common Mode Rejection Ratio	CMRR	0V ≤ V_{CM} ≤ 1.5V, 2.3V ≤ V_{CM} ≤ 2.7V	60	81		dB
		-0.2V ≤ V_{CM} ≤ 0V, 2.7V ≤ V_{CM} ≤ 2.9V	50	74		dB
Power Supply Rejection Ratio	PSRR	1.8V ≤V^+ ≤ 5V, V_{CM}=0.5V	75	100		dB
Input Common-Mode Voltage	CMVR	For CMRR Range ≥ 50dB	V^- - 0.2	-0.2		V
				3	V^+ + 0.2	V
Large Signal Voltage Gain	A_V	R_L=600Ω~ 1.35V, V_O=0.2V~2.5V	87	104		dB
		R_L=2kΩ~1.35V, V_O=0.2V~2.5V	92	110		dB
Output Swing	V_O	R_L=600Ω~ 1.35V, V_{IN}=100 mV	2.55	2.62		V
		R_L=600Ω~ 1.35V, V_{IN}=-100 mV		0.083	0.11	V
		R_L=2kΩ~1.35V, V_{IN}=100mV	2.65	2.675		V
		R_L=2kΩ~1.35V, V_{IN}=-100mV		0.025	0.04	V
Output Short Circuit Current	I_O	Sourcing, V_O=0V, V_{IN}=100mV	20	30		mA
		Sinking, V_O=0V, V_{IN}=-100mV	18	25		mA
Turnon Time from Shutdown	T_{ON}			12.5		μs
Turnon Voltage	V_{SHDN}			1.9		V
Turnoff Voltage				0.8		V
Slew Rate	SR			0.4		V/μs
Gain-Bandwidth Product	GBW			1.4		MHz
Phase Margin	Φ_m			70		°
Gain Margin	G_m			7.5		dB
Input-Referred Voltage Noise	e_n	f =10kHz, V_{CM}=0.5V		57		nV/$\sqrt{Hz}$
Input-Referred Current Noise	i_n	f =10kHz		0.08		pA/$\sqrt{Hz}$
Total Harmonic Distortion	THD	f=1kHz, A_V=+1, R_L=600Ω, V_{IN}=1V_{PP}		0.02		%

■ ELECTRICAL CHARACTERISTICS 5V

(T_J =25°C, V^+=5V, V^-=0V, $\overline{SHDN}$ connect to V^+, V_{CM} and V_O=V^+/2, R_L > 1MΩ, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Input Offset Voltage	V_{OS}			1	4	mV
Input Bias Current	I_B			14	35	nA
Input Offset Current	I_{OS}			9	25	nA
Supply Current	I_q			116	210	μA
		In Shutdown		0.2	1	μA
Common Mode Rejection Ratio	CMRR	0V≤V_{CM}≤3.8V, 4.6V≤V_{CM}≤5V	60	86		dB
		-0.2V ≤ V_{CM} ≤ 0V, 5V ≤ V_{CM} ≤5.2V	50	78		dB
Power Supply Rejection Ratio	PSRR	1.8V ≤V^+ ≤ 5V, V_{CM}=0.5V	75	100		dB
Input Common-Mode Voltage	CMVR	For CMRR Range ≥ 50dB	V^- - 0.2	-0.2		V
				5.3	V^+ + 0.2	V
Large Signal Voltage Gain	A_V	R_L=600Ω~ 2.5V, V_O=0.2V~4.8V	88	102		dB
		R_L=2kΩ~2.5V, V_O=0.2V~4.8V	94	113		dB
Output Swing	V_O	R_L=600Ω~2.5V, V_{IN}=±100mV	4.855	4.89		V
				0.12	0.16	V
		R_L=2kΩ~2.5V, V_{IN}=±100mV	4.945	4.967		V
				0.037	0.065	V
Output Short Circuit Current	I_O	Sourcing, V_O=0V, V_{IN}=100mV	80	100		mA
		Sinking, V_O=5V, V_{IN}=-100mV	58	65		mA
Turn on Time from Shutdown	Ton			8.4		μs
Turn on Voltage	V_{SHDN}			4.2		V
Turnoff Voltage				0.8		V
Slew Rate	SR			0.42		V/μs
Gain-Bandwidth Product	GBW			1.5		MHz
Phase Margin	Φ_m			71		°
Gain Margin	G_m			8		dB
Input-Referred Voltage Noise	e_n	f =10kHz, V_{CM}=0.5V		50		nV/$\sqrt{Hz}$
Input-Referred Current Noise	i_n	f =10kHz		0.08		pA/$\sqrt{Hz}$
Total Harmonic Distortion	THD	f=1kHz, A_V=+1, R_L=600Ω, V_{IN}=1V_{PP}		0.02		%

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