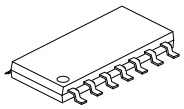
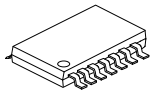
LV324

LINEAR INTEGRATED CIRCUIT

GENERAL PURPOSE, LOW VOLTAGE, RAIL-TO-RAIL OUTPUT OPERATIONAL AMPLIFIERS



SOP-14



TSSOP-14U

■ DESCRIPTION

The UTC **LV324** is a quad op amp with low supply current and low voltage (2.7~5.5V). It brings nice performance to low voltage and low power systems. With a 1MHz unity-gain frequency. The UTC **LV324** has a guaranteed 1V//μs slew rate and low supply current. It provides heavy rail-to-rail (R-to-R) output swing loads and the input common-mode voltage range including ground. Besides, it is also capable for comfortably driving large capacitive loads.

The UTC **LV324** has bipolar input and CMOS output for improved noise performance and higher output current drive. It's the most cost effective solution for the applications where low voltage operation, space saving and low price are required.

■ FEATURES

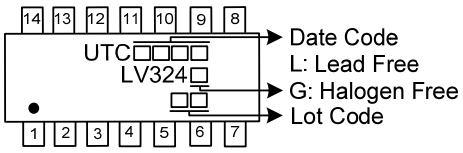
* 4-Channels Op amps
* Rail-to-Rail Output Swing
* Widely Input Common-Mode Voltage Range
* Low Voltage Operation
* Low Supply Current: Typ.=410μA @ V^+ =5V, V^-=0V
* Perfect AC characteristics:
  GBW: Typ.=1MHz
  SR: Typ.=1V/μs
  φ_m: Typ.=60Deg
  G_m: Typ.=10dB.

■ ORDERING INFORMATION

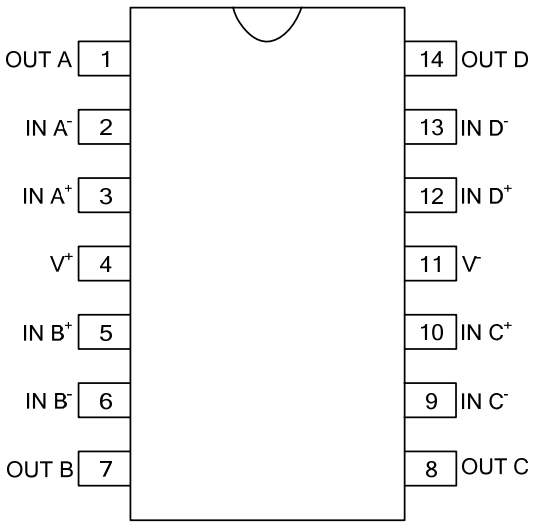
Ordering Number		Package	Packing
Lead Free	Halogen Free		
LV324L-S14-R	LV324G-S14-R	SOP-14	Tape Reel
LV324L-UEB-R	LV324G-UEB-R	TSSOP-14U	Tape Reel

LV324G-S14-R (1)Packing Type (2)Package Type (3)Green Package	(1) R: Tape Reel (2) S14: SOP-14, UEB: TSSOP-14U (3) G: Halogen Free and Lead Free, L: Lead Free

■ MARKING



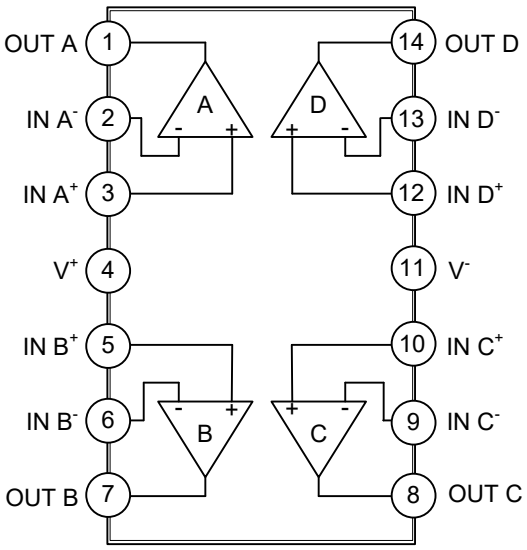
■ PIN CONFIGURATION



■ PIN DESCRIPTION

PIN NO.	PIN NAME	FUNCTION
1	OUT A	Output of channel A
2	IN A$^-$	Inverting Input of Channel A
3	IN A$^+$	Non-Inverting Input of Channel A
4	V$^+$	Positive of Supply Voltage
5	IN B$^+$	Non-Inverting Input of Channel B
6	IN B$^-$	Inverting Input of Channel B
7	OUT B	Output of channel B
8	OUT C	Output of channel C
9	IN C$^-$	Inverting Input of Channel C
10	IN C$^+$	Non-Inverting Input of Channel C
11	V$^-$	Negative of Supply Voltage
12	IN D$^+$	Non-Inverting Input of Channel D
13	IN D$^-$	Inverting Input of Channel D
14	OUT D	Output of channel D

■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATING

PARAMETER		SYMBOL	RATINGS	UNIT
Differential Input Voltage		V_{IDM}	±Supply Voltage	V
Supply Voltage (V^+-V^-)		V^+-V^-	5.5	V
Output Short Current to V^+		$I_{O(SC)}$	Note 2	A
Output Short Current to V^-		$I_{O(SC)}$	Note 3	A
Power Dissipation	SOP-14	P_D	850	mW
	TSSOP-14U		700	mW
Junction Temperature (Note 4)		T_J	+150	°C
Storage Temperature Range		T_{STG}	-65 ~ +150	°C

Notes: 1. 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.
2. Shorting output to V^+ will adversely affect reliability.
3. Shorting output to V^- will adversely affect reliability.
4. The maximum power dissipation is a function of $T_{J(MAX)}$, θ_{JA}. The maximum allowable power dissipation at any ambient temperature is $P_D=(T_{J(MAX)}-T_A)/\theta_{JA}$. All numbers apply for packages soldered directly onto a PC Board.

■ RECOMMENDED OPERATING CONDITIONS

(V^+=2.7V~5.5V, and V^-=0V, T_A=25°C, unless otherwise specified)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V^+ - V^-	2.7 ~ 5.5	V
Operating Free-Air Temperature	T_{OPR}	-40 ~ +125	°C

Note: The industrial temperature devices operate over this extended temperature range, but with reduced performance. In any case, the internal Junction Temperature (T_J) must not exceed the Absolute Maximum specification of +150°C.

■ 2.7V ELECTRICAL CHARACTERISTICS

All limits guaranteed for T_J=25°C, V^+=2.7V, V^-=0V, V_{CM}=1.0V, V_{OUT}=V^+/2 and R_L>1MΩ, unless otherwise specified.

PARAMETER	SYMBOL	TEST CONDITIONS	MIN (Note 6)	TYP (Note 5)	MAX (Note 6)	UNIT
DC CHARACTERISTICS						
Input Offset Voltage	V_{OS}			1.7	7	mV
Input Offset Voltage Average Drift	TCV_{OS}			5		μV/°C
Input Bias Current	I_B			11	250	nA
Input Offset Current	I_{OS}			5	50	nA
Common Mode Rejection Ratio	CMRR	0V≤V_{CM}≤1.7V	50	63		dB
Power Supply Rejection Ratio	PSRR	2.7V≤V^+≤5V, V_O=1V	50	60		dB
Input Common-Mode Voltage Range	V_{CM}	For CMRR≥50dB	0	-0.2		V
				1.9	1.7	V
Output Swing	V_{OUT}	R_L=10kΩ to 1.35V	V^+-100	V^+-10		mV
				60	180	mV
Supply Current	I_S	All four amplifiers		260	680	μA
AC CHARACTERISTICS						
Gain-Bandwidth Product	GBWP	C_L=200pF		1		MHZ
Phase Margin	φm			60		Deg
Gain Margin	Gm			10		dB
Input-Referred Voltage Noise	en	f=1kHZ		46		nV/√HZ
Input-Referred Current Noise	in	f=1kHZ		0.17		pA/√HZ

■ 5V ELECTRICAL CHARACTERISTICS (Cont.)

All limits guaranteed for T_J=25°C, V^+=5V, V^-=0V, V_{CM}=2.0V, V_O=V^+/2 and R_L>1MΩ, unless otherwise specified.
Boldface limits apply at the temperature extremes.

PARAMETER	SYMBOL	TEST CONDITIONS	MIN (Note 2)	TYP (Note 1)	MAX (Note 2)	UNIT
DC CHARACTERISTICS						
Input Offset Voltage	V_{OS}			1.7	7	mV
		T_A= Full range			**9**	mV
Input Offset Voltage Average Drift	TCV_{OS}			5		μV/°C
Input Bias Current	I_B			11	250	nA
		T_A= Full range			**500**	nA
Input Offset Current	I_{OS}			5	50	nA
		T_A= Full range			**150**	nA
Common Mode Rejection Ratio	CMRR	0V ≤ V_{CM} ≤ 4V	50	65		dB
Power Supply Rejection Ratio	PSRR	2.7V ≤ V^+ ≤ 5V, V_O=1V, V_{CM}=1V	50	60		dB
Input Common-Mode Voltage Range	V_{CM}	For CMRR ≥ 50dB	0	-0.2		V
				4.2	4	V
Large Signal Voltage Gain (Note 3)	A_V		15	100		V/mV
		T_A= Full range	**10**			V/mV
Output Swing	V_O	R_L=2kΩ to 2.5V	V^+-300	V^+-40		mV
		T_A= Full range	**V^+-400**			mV
				120	300	mV
		T_A= Full range			**400**	mV
		R_L=10kΩ to 2.5V	V^+-100	V^+-10		mV
		T_A= Full range	**V^+-200**			mV
				65	180	mV
		T_A= Full range			**280**	mV
Output Short Circuit Current	I_O	Sourcing, V_O=0V	5	60		mA
		Sourcing, V_O=5V	10	160		mA
Supply Current	I_S	All four amplifiers		410	830	μA
		T_A= Full range			**1160**	μA
AC CHARACTERISTICS						
Slew Rate	SR	(Note 4)		1		V/μs
Gain-Bandwidth Product	GBWP	C_L=200pF		1		MHz
Phase Margin	φ_m			60		Deg
Gain Margin	G_m			10		dB
Input-Referred Voltage Noise	e_n	f=1kHz		39		nV/√Hz
Input-Referred Current Noise	i_n	f=1kHz		0.21		pA/√Hz

Notes: 1. Typical values represent the most likely parametric norm as determined at the time of characterization. Actual typical values may vary over time and will also depend on the application and configuration. The typical values are not tested and are not guaranteed on shipped production material.
2. All limits are guaranteed by testing or statistical analysis.
3. R_L is connected to V^-. The output voltage is 0.5V ≤ V_O ≤ 4.5V.
4. Connected as voltage follower with 3V step input. Number specified is the slower of the positive and negative slew rates.