

## LOW POWER QUAD OPERATIONAL AMPLIFIER

The WSL324 contains four independent high gain operational amplifiers with internal frequency compensation. The four Op-Amps operate over a wide voltage range from a single power supply. Also use a split power supply. The device has low power supply current drain, regardless of the power supply voltage. The low power drain also makes the WSL324 a good choice for Battery operation.

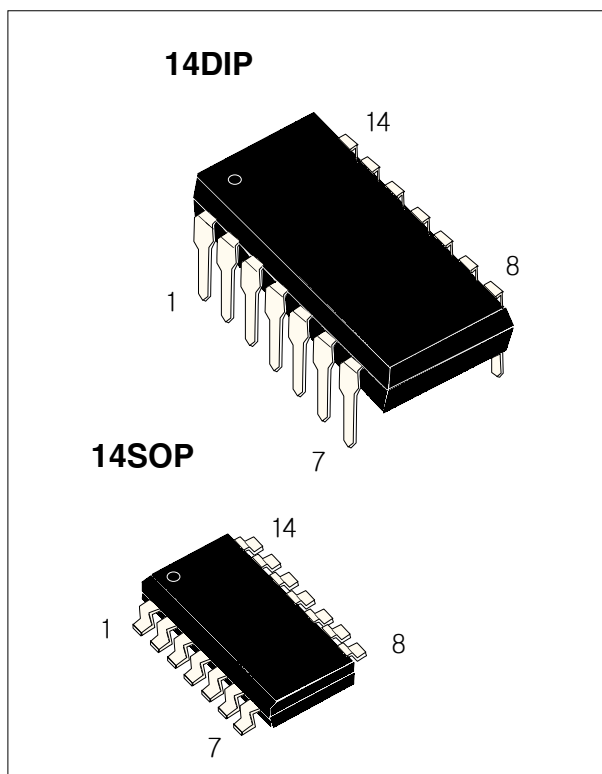
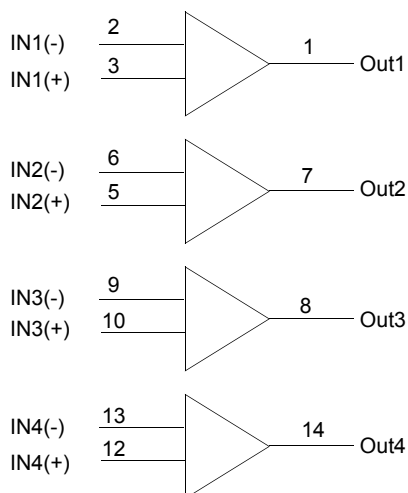
When your project calls for a traditional Op-Amp function, now you can streamline your design with a simple single power supply. Use ordinary +5V DC common to practically any Digital System or Personal Computer application, without requiring an extra 15V power supply just to have the interface electronics you need.

The WSL324 is a versatile, rugged workhouse with a thousand-and-one use, from amplifying signals from a variety of transducers to DC gain blocks, or any OP-Amp function. The attached pages offer some recipes that will have your project cooking in no time.

### FEATURES

- ◇ Internally frequency compensated for unity gain
- ◇ Large DC voltage gain :100dB
- ◇ Wide power supply range :3V~32V(or  $\pm 1.5 \sim \pm 16V$ )
- ◇ Input common mode Voltage range includes ground
- ◇ Large output voltage swing:0V DC to  $V_{cc}-1.5V$  DC
- ◇ Power drain suitable for Battery operation
- ◇ Low input offset voltage and offset current
- ◇ differential input range equal to the power supply voltage

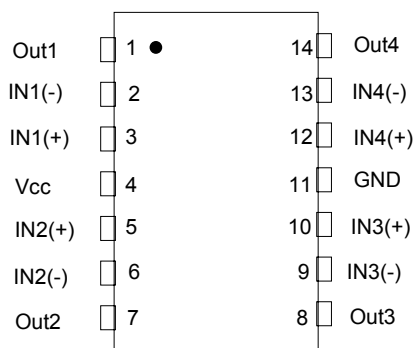
### LOGIC DIAGRAM



### Ordering Information

Device	Operating Temperature	Package
WSL324PZ	0~70°C	14DIP
WSL324RZ		14SOP

### PIN ASSIGNMENT



# ABSOLUTE MAXIMUM RATINGS\*

Characteristic	Symbol	Value	Unit
Power Supply Voltages Single Supply Split Supplies	VCC	32 ± 16	V
Input Differential Voltage Range(1)	VIDR	± 32	V
Input Common Mode Voltage Range	VICR	-0.3 to 32	V
Output Short Circuit Duration	ISC	Continuous	
Junction Temperature(14DIP)	Tj	150	°C
Storage Temperature(14DIP)	Tstg	-55~125	°C
Input Current,per Pin(2)	IIN	50	mA
Lead Temperature,1mm from Case for 10sec.	TL	260	°C

\* Maximum Ratings are those values beyond which damage to the device may occur.

Function operation should be restricted to the Recommended Operating Conditions.

□ derating :14DIP :-10mW/°C from 65°C to 125°C

8SOP :-7mW/°C from 65°C to 125°C

## [NOTE]

(1)Split Power Supplies

(2)VIN<0.3V. This input current will only exist when voltage at any of the input leads is driven negative.

# RECOMMENDED OPERATING CONDITIONS

Characteristic	Symbol	Min	Max	Unit
DC Supply Voltage	VCC	± 2.5 or 5.0	± 15 or 30	V
Operating Temperature (All Package Types)	TA	0	+70	°C

This device contains protection circuitry to guard against damage due to high static voltages or electric fields. However,precautions must be taken to avoid applications of any voltage higher than maximum rated voltages to this high-impedance circuit.For proper operation,VIN and VOUT should be constrained to the range  $GND \leq (VIN \text{ and } VOUT) \leq VCC$ .

Unused inputs must always be tied to an appropriate logic voltage level(e.g.,either GND or VCC ).

Unused outputs must be left open.

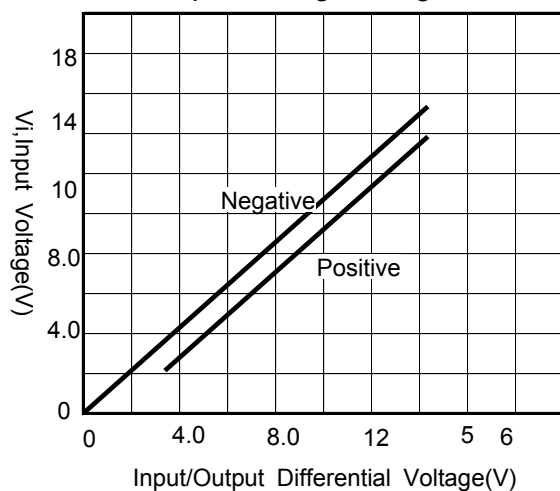
**ELECTRICAL CHARACTERISTICS**
**TA=0~70℃**

Characteristic	Symbol	Test condition	Min.	Typ.	Max.	Unit
Maximum Input Offset Voltage	$V_{IO}$	$V_O=1.4V$ $V_{CC}=5.0\sim 30V$ $R_S=0\Omega$ , $V_{ICM}=0V$ to $V_{CC}-1.7V$			9.0	mV
Input offset Voltage Drift	$\Delta V_{IO}/\Delta T$	$R_S=0\Omega$ , $V_{CC}=30V$		7.0		$\mu V/^\circ C$
Maximum Input offset Current	$I_{IO}$	$V_{CC}=5.0V$			150	nA
Input offset Current Drift	$\Delta I_{IO}/\Delta T$	$R_S=0\Omega$ , $V_{CC}=30V$		10		$pA/^\circ C$
Maximum Input Bias current	$I_{IB}$	$V_{CC}=5.0V$			-500	nA
Input Common Mode Voltage Range	$V_{ICR}$	$V_{CC}=30V$	0		28	V
Maximum Power Supply Current	$I_{CC}$	$R_L=\infty$ , $V_{CC}=30V$ , $V_O=0V$ $R_L=\infty$ , $V_{CC}=5V$ , $V_O=0V$			3 1.2	mA
Minimum Large Signal Open-Loop Voltage Gain	$A_{VOL}$	$V_{CC}=15V$ , $R_L \geq 2k\Omega$	15			V/mV
Minimum Output High Level Voltage Swing	$V_{OH}$	$V_{CC}=30V$ , $R_L=2k\Omega$ $V_{CC}=30V$ , $R_L=10k\Omega$	26 27			V
Maximum Output low Level Voltage Swing	$V_{OL}$	$V_{CC}=5V$ , $R_L=10k\Omega$			20	mV
Common Mode Rejection	CMR	$V_{CC}=30V$ , $R_S=10k\Omega$	65*			dB
Power Supply Rejection	PSR	$V_{CC}=30V$	65			dB
Channel Separation	CS	$f=1KHz$ to $20KHz$ , $V_{CC}=30V$	-120*			dB
maximum Output Short Circuit to GND	ISC	$V_{CC}=30V$			60*	mA
Minimum Output Source Current	$I_{SOURCE}$	$V_{IN+}=1V$ , $V_{IN}=0V$ , $V_{CC}=15V$ , $V_O=0V$	10			mA
Minimum Output Sink Current	$I_{SINK}$	$V_{IN+}=0V$ , $V_{IN-}=1V$ , $V_{CC}=15V$ , $V_O=15V$	5			mA
		$V_{IN+}=0V$ , $V_{IN-}=1V$ , $V_{CC}=15V$ , $V_O=0.2V$	12*			$\mu A$
Differential Input Voltage Range	$V_{IDR}$	All $V_{IN} \geq GND$ or $V$ -supply(If Used)			$V_{CC}^*$	V

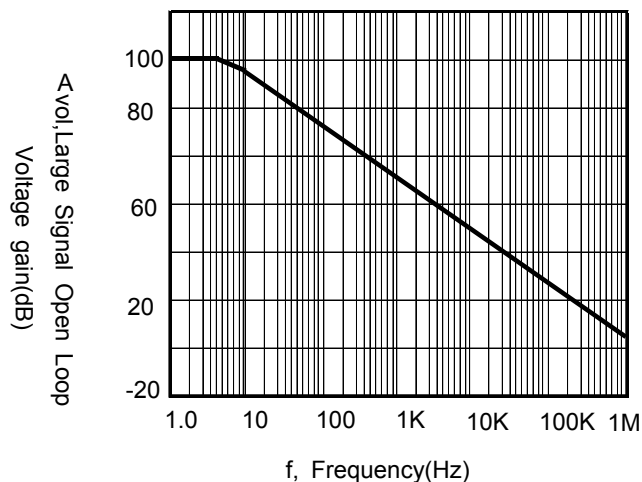
\*=@ 25℃

# TYPICAL PERFORMANCE CHARACTERISTICS

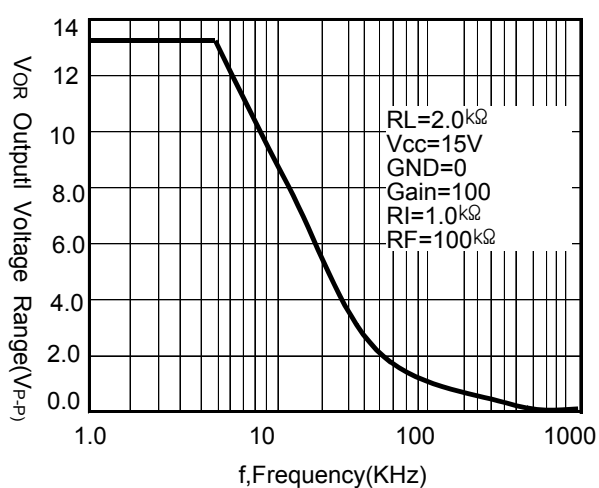
Input Voltage Range



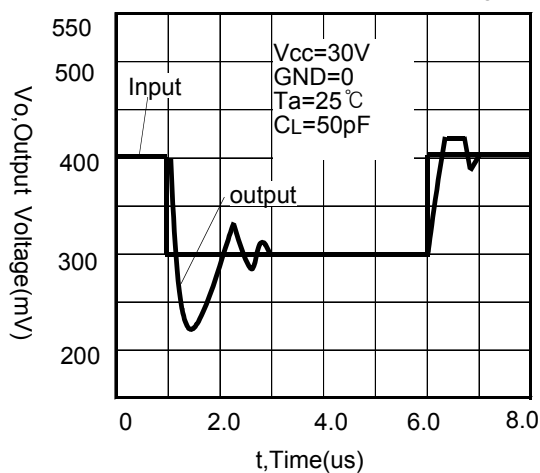
Open -Loop Frequency



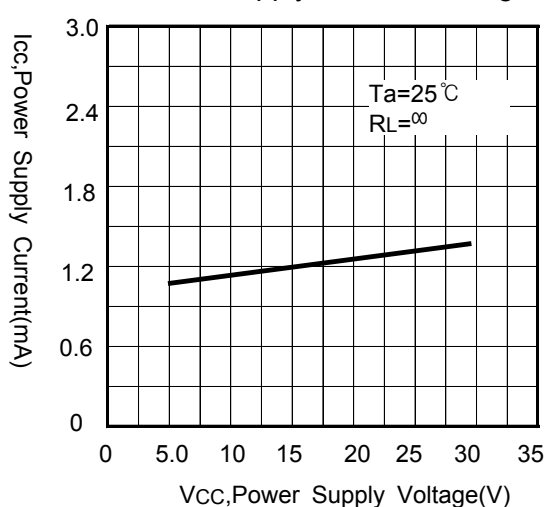
Large Signal Frequency Response



Small Signal Voltage Follower Pulse Response(Noninverting)



Power Supply Current-Voltage



Input Bias current-Power Supply Voltage

