



## LV358S

### LINEAR INTEGRATED CIRCUIT

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

### DESCRIPTION

The UTC **LV358S** is a dual 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 **LV358S** has a guaranteed 1 V/ $\mu$ s 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 **LV358S** 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.

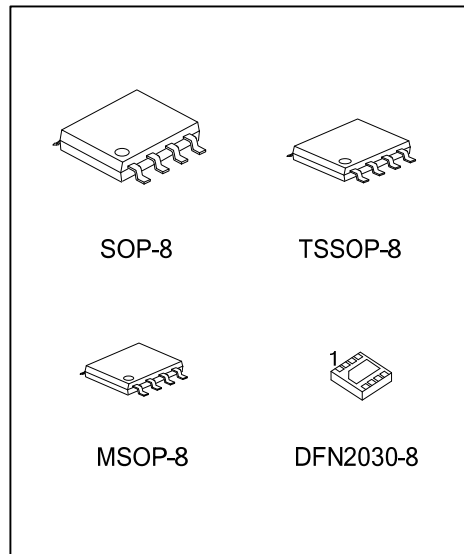
### FEATURES

- \* Supply Voltage: 2.7~5.5V
- \* Supply current: 95 $\mu$ A / Amplifier (Typ.)
- \* Input Offset Voltage: 7mV (Max.)
- \* Rail-to-Rail outputs
- \* Slew Rate 1.0V/ $\mu$ s(Typ.)

### ORDERING INFORMATION

Ordering Number		Package	Packing
Lead Free	Halogen Free		
LV358SL-S08-R	LV358SG-S08-R	SOP-8	Tape Reel
LV358SL-SM1-R	LV358SG-SM1-R	MSOP-8	Tape Reel
LV358SL-P08-R	LV358SG-P08-R	TSSOP-8	Tape Reel
LV358SL-K08-2030-R	LV358SG-K08-2030-R	DFN2030-8	Tape Reel

<p>LV358SG-S08-R</p> <p>(1) Packing Type (2) Package Type (3) Green Package</p>	<p>(1) R: Tape Reel (2) S08: SOP-8, P08: TSSOP-8, SM1: MSOP-8 K08-2030: DFN2030-8 (3) G: Halogen Free and Lead Free, L: Lead Free</p>
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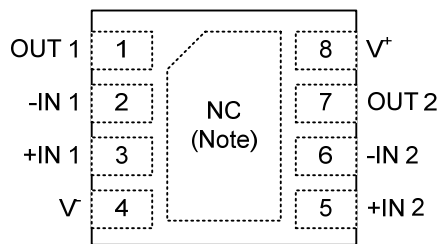
# LV358S

## LINEAR INTEGRATED CIRCUIT

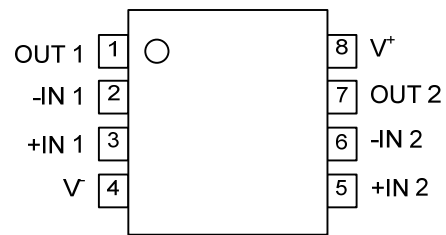
### MARKING

PACKAGE	MARKING
SOP-8 / MSOP-8	
TSSOP-8	
DFN2030-8	

### PIN CONFIGURATION



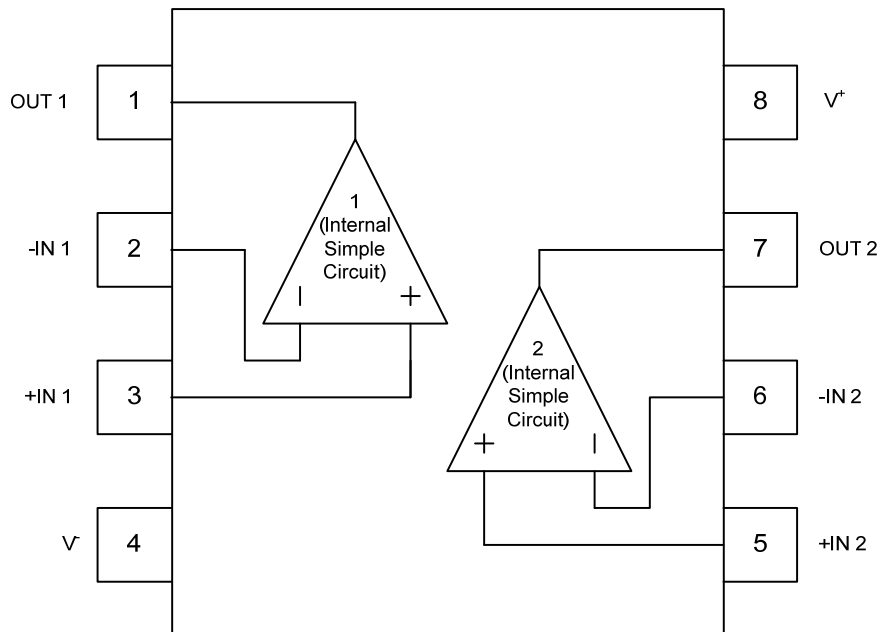
DFN2030-8 Top View



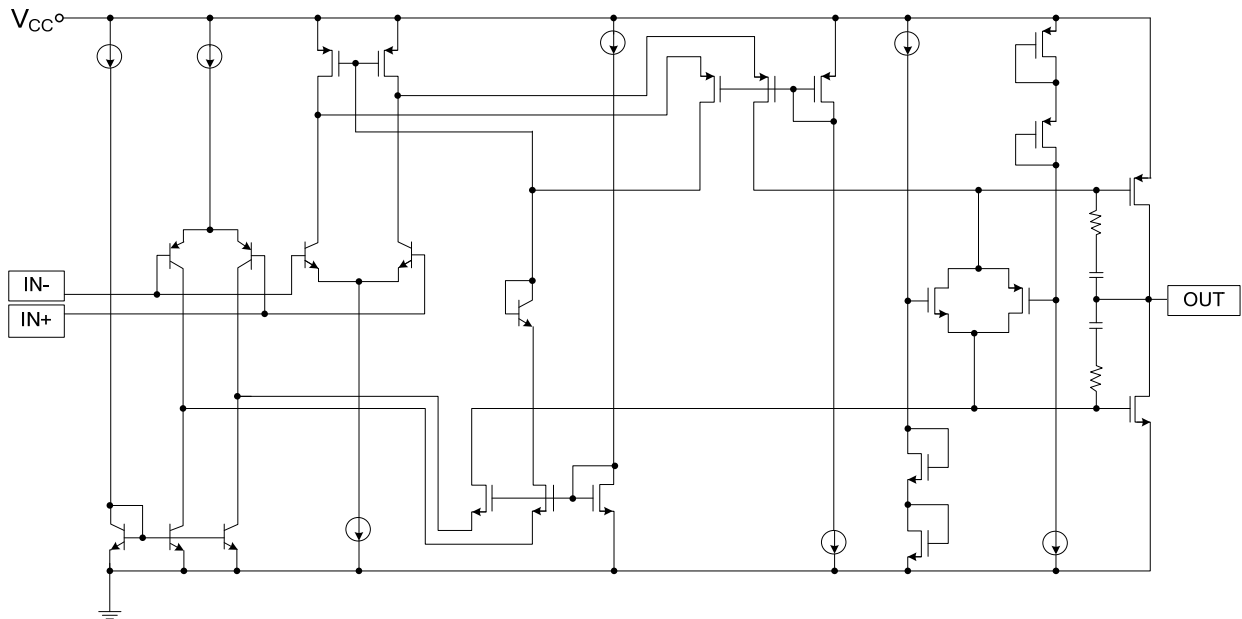
SOP-8 / TSSOP-8 / MSOP-8

Note: No connect.

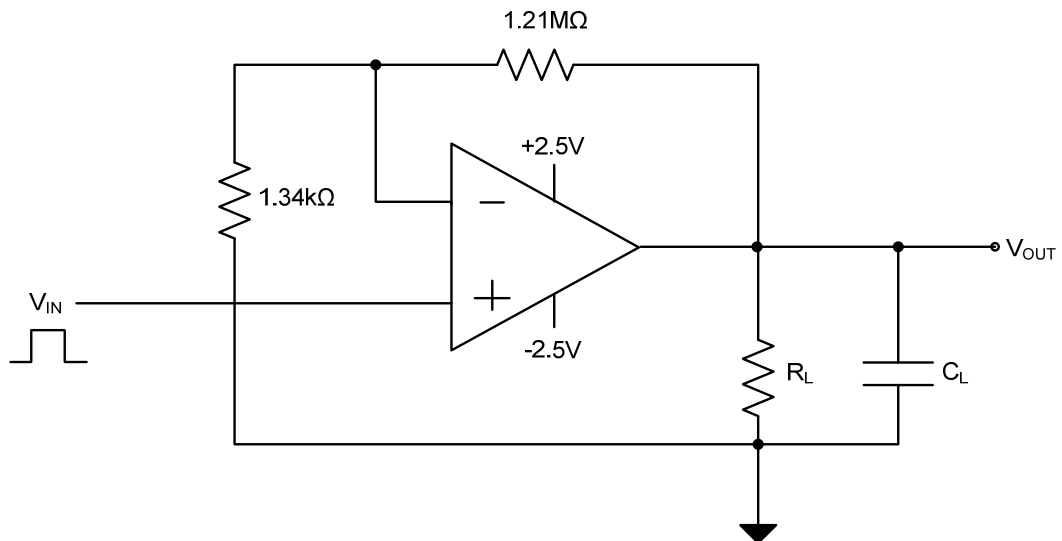
### BLOCK DIAGRAM



### INTERNAL SIMPLE CIRCUIT



### TEST CIRCUIT FOR STABILITY VS CAPACITIVE LOAD



### ■ ABSOLUTE MAXIMUM RATINGS (Note1)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	$V^+ - V^-$	2.7 ~ 5.5	V
Supply Voltage ( $V^+ - V^-$ )	$V^+ - V^-$	5.5	V
Differential Input Voltage		$\pm$ Supply Voltage	
Junction Temperature	$T_J$	+150	$^{\circ}$ C
Operation Temperature	$T_{OPR}$	-40~+85	$^{\circ}$ C
Storage Temperature	$T_{STG}$	-65~+150	$^{\circ}$ 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	RATINGS	UNIT
Thermal Resistance (Note 1)	SOP-8	210	$^{\circ}$ C/W
	MSOP-8	260	$^{\circ}$ C/W
	TSSOP-8	170	$^{\circ}$ C/W
	DFN2030-8	70	$^{\circ}$ C/W

Note: All numbers are typical, and apply for packages soldered directly note a PC board is still air.

### ■ 2.7V ELECTRICAL CHARACTERISTICS

( $T_A=25^{\circ}$ C,  $V^+ = 2.7V$ ,  $V^- = 0V$ ,  $V_{CM} = 1.0V$  and  $R_L > 1M\Omega$ , unless otherwise specified)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
<b>DC CHARACTERISTICS</b>						
Supply Current/Amplifier	$I_Q$			80	170	$\mu$ A
Power Supply Rejection Ratio	PSRR	$2.7V \leq V^+ \leq 5V$ , $V_{OUT} = 1V$	50	72		dB
Input Offset Voltage	$V_{OS}$			0.65	7	mV
Input Offset Voltage Average Drift				5		$\mu$ V/ $^{\circ}$ C
Input Bias Current	$I_B$			11		nA
Input Offset Current	$I_{OS}$			5		nA
Common-mode Voltage Range	$V_{CM}$	For $CMRR \geq 50dB$	0	-0.2		V
				1.9	1.7	V
Common-Mode Rejection Ratio	CMRR	$0V \leq V_{CM} \leq 1.7V$	50	75		dB
Output Swing	$V_O$	$R_L = 10k\Omega$ to 1.35V	$V^+ - 100$	$V^+ - 10$		mV
				60	180	mV
<b>AC CHARACTERISTICS</b>						
Gain Bandwidth Product	GBW	$C_L = 200pF$		1		MHz
Phase Margin	$\Phi_M$			60		Deg
Gain Margin	$G_m$			10		dB
Input Referred Voltage Noise	$e_n$	$F = 1KHz$		46		$\frac{nV}{\sqrt{Hz}}$
Input Referred Current Noise	$i_n$	$F = 1KHz$		0.17		$\frac{pA}{\sqrt{Hz}}$

### ■ 5V ELECTRICAL CHARACTERISTICS

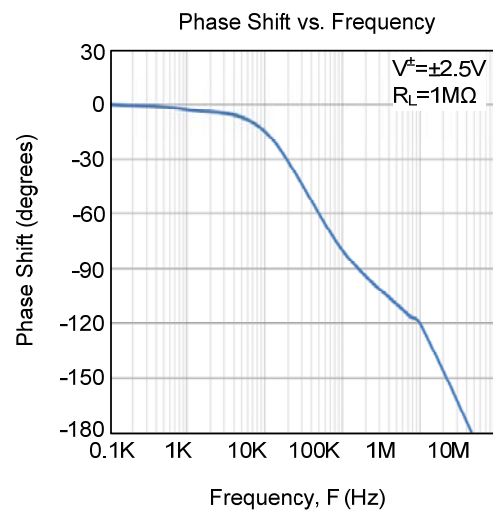
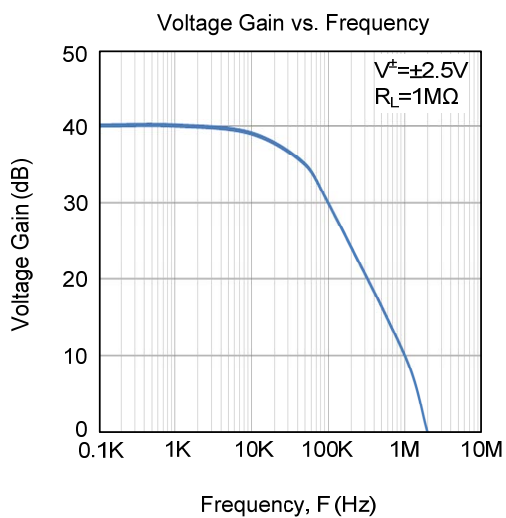
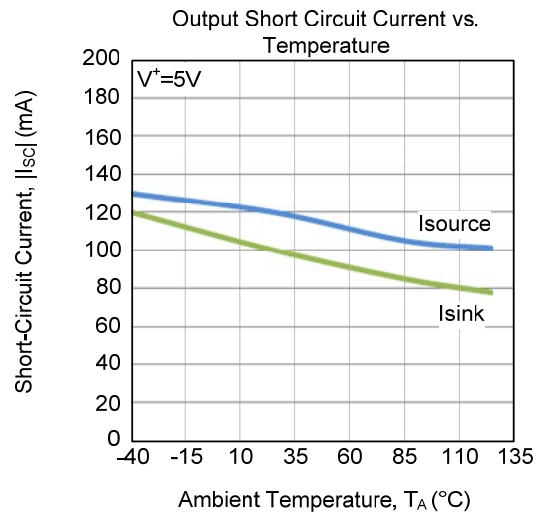
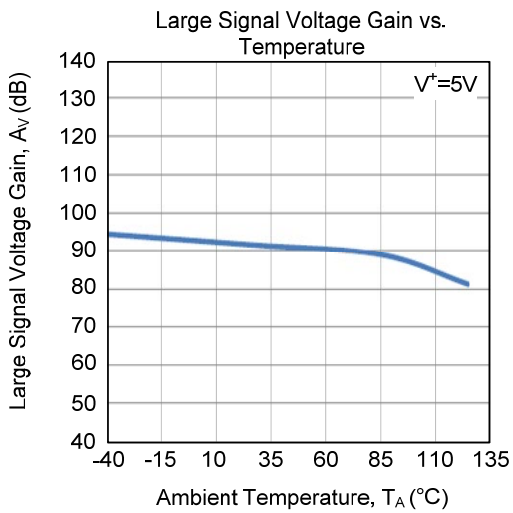
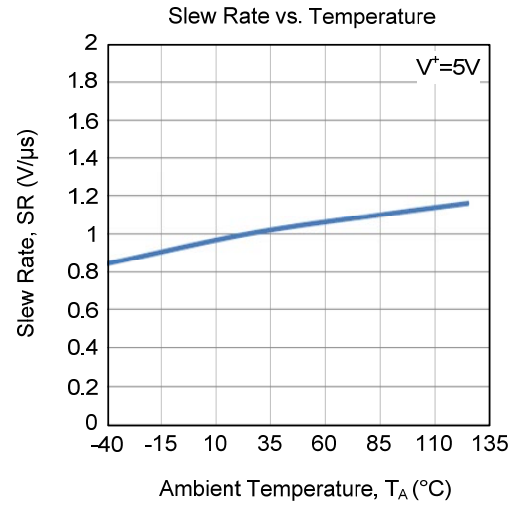
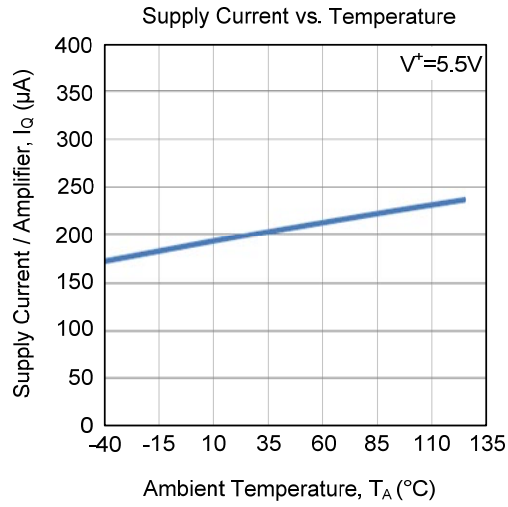
( $T_A=25^{\circ}\text{C}$ ,  $V^+ = 5.0\text{V}$ ,  $V^- = 0\text{V}$ ,  $V_{\text{CM}} = 1.0\text{V}$  and  $R_L > 1\text{M}\Omega$ , unless otherwise specified)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT	
<b>DC CHARACTERISTICS</b>							
Supply Current/Amplifier	$I_q$			95	220	$\mu\text{A}$	
Power Supply Rejection Ratio	PSRR	$2.7\text{V} \leq V^+ \leq 5\text{V}$ $V_{\text{OUT}}=1\text{V}$ , $V_{\text{CM}}=1\text{V}$	50	72		dB	
Input Offset Voltage	$V_{\text{OS}}$			0.65	7	mV	
Input Offset Voltage Average Drift				5		$\mu\text{V}/^{\circ}\text{C}$	
Input Bias Current	$I_B$			15		nA	
Input Offset Current	$I_{\text{OS}}$			5		nA	
Input Common-Mode Voltage Range	$V_{\text{CM}}$	For $\text{CMRR} \geq 50\text{dB}$	0	-0.2		V	
				4.2	4	V	
Common-Mode Rejection Ratio	CMRR	$0\text{V} \leq V_{\text{CM}} \leq 4\text{V}$	50	75		dB	
Large Signal Voltage Gain(Note 1)	$A_v$	$R_L=2\text{K}\Omega$	80	100		dB	
Output Swing	$V_o$	$R_L=2\text{K}\Omega$ to 2.5V	$V_{\text{OH}}$	$V^+-300$	$V^+-40$		mV
			$V_{\text{OL}}$		120	300	mV
		$R_L=10\text{K}\Omega$ to 2.5V	$V_{\text{OH}}$	$V^+-100$	$V^+-10$		mV
			$V_{\text{OL}}$		65	180	mV
Output Short Circuit Current	$I_{\text{SC}}$	Sourcing, $V_{\text{OUT}}=0\text{V}$	5	120		mA	
		Sinking, $V_{\text{OUT}}=5\text{V}$	10	100		mA	
<b>AC CHARACTERISTICS</b>							
Slew Rate	SR	(Note 2)		1		$\text{V}/\mu\text{s}$	
Gain Bandwidth Product	GBW	$C_L=200\text{pF}$		1		MHz	
Phase Margin	$\Phi_M$			60		Deg	
Gain Margin	$G_m$			10		dB	
Input Referred Voltage Noise	$e_n$	$f=1\text{KHz}$		39		$\frac{\text{nV}}{\sqrt{\text{Hz}}}$	
Input Referred Current Noise	$i_n$	$f=1\text{KHz}$		0.21		$\frac{\text{pA}}{\sqrt{\text{Hz}}}$	

Notes: 1.  $R_L$  is connected to  $V^-$ . The output voltage is  $0.5\text{V} \leq V_{\text{OUT}} \leq 4.5\text{V}$ .

2. Connected as voltage follower with 3V step input. Number specified is these lower of the positive and negative slew rates.

## TYPICAL CHARACTERISTICS



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