

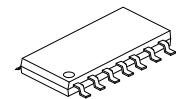
TL054

LINEAR INTEGRATED CIRCUIT

**ENHANCED-JFET
LOW-OFFSET OPERATIONAL
AMPLIFIER**

■ DESCRIPTION

The UTC **TL054** is a high speed J-FET input quad operational amplifier. It incorporates well matched, high voltage J-FET and bipolar transistors in a monolithic integrated circuit. The device features high slew rates, low input bias and offset current, and low offset voltage temperature coefficient.



SOP-14

■ FEATURES

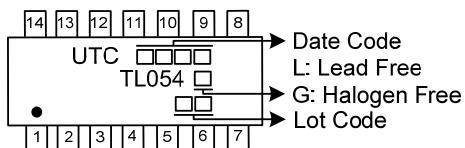
- * Supply Voltage: $\pm 5.0 \sim \pm 15.0$ V
- * Supply Current/Amplifier: 3.2mA (Max.)
- * Input Offset Voltage: 4.0mV (Max.)
- * Slew Rate: 13.0V/ μ s (Typ.)

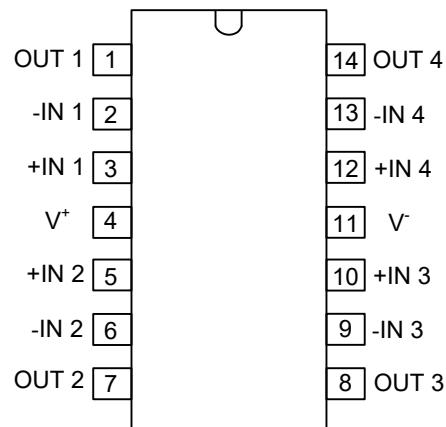
■ ORDERING INFORMATION

Ordering Number		Package	Packing
Lead Free	Halogen Free		
TL054L-S14-R	TL054G-S14-R	SOP-14	Tape Reel

TL054G-S14-R 	(1)Packing Type (2)Package Type (3)Green Package	(1) R: Tape Reel (2) S14: SOP-14 (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	OUT 1	Output of 1 AMP
2	-IN 1	Inverting input of 1 AMP
3	+IN 1	Non-inverting input of 1 AMP
4	V ⁺	Positive power supply
5	-IN 2	Non-inverting input of 2 AMP
6	+IN 2	Inverting input of 2 AMP
7	OUT 2	Output of 2 AMP
8	OUT 3	Output of 3 AMP
9	-IN 3	Inverting input of 3 AMP
10	+IN 3	Non-inverting input of 3 AMP
11	V ⁻	Negative power supply
12	-IN 4	Non-inverting input of 4 AMP
13	+IN 4	Inverting input of 4 AMP
14	OUT 4	Output of 4 AMP

■ ABSOLUTE MAXIMUM RATING

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage (Note 1)	$V^+ - V^-$	± 18	V
Differential Input Voltage (Note 2)		± 30	V
Input Voltage Range (Note 1, 3)	V_I	± 15	V
Input Current	I_I	± 1	mA
Output Current	I_O	± 80	mA
Total Current into V^+		160	mA
Total Current out of V^-		160	mA
Junction Temperature	T_J	150	°C
Storage Temperature	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. All voltage values, except differential voltages, are with respect to the midpoint between V^+ and V^- .
3. Differential voltages are at +IN with respect to -IN.
4. The magnitude of the input voltage must never exceed the magnitude of the supply voltage or 15V, whichever is less

■ THERMAL DATA

PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient	θ_{JA}	86	°C/W

■ ELECTRECOMMENDED OPWRAING CONDITIONS

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	$V^+ - V^-$	$\pm 5.0 \sim \pm 15$	V
Operating Junction Temperature Range	T_{OPR}	-40 ~ +125	°C

■ ELECTRICAL CHARACTERISTICS ($V^+ - V^- = \pm 5 \sim 15V$, $T_A=25^\circ C$ unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT	
Supply Current/Amplifier	I_Q	$V_O=0$, No Load		2.7	3.2	mA	
Power Supply Rejection Ratio	PSRR	$V^{\pm}=\pm 5V \sim \pm 15V$, $V_O=0$	75	99		dB	
Input Offset Voltage	V_{OS}	$V_O=0$, $V_{CM}=0$		0.56	4	mV	
Input Bias Current	I_{IB}	$V_O=0$, $V_{CM}=0$ See Figure 5		30		pA	
Input Offset Current	I_{IO}	$V_O=0$, $V_{CM}=0$ See Figure 5		5		pA	
Common-Mode Voltage Range	V_{CM}		$V^+ + 4$		$V^+ - 4$	V	
Common-Mode Rejection Ratio	CMRR	$V_{CM}=V_{CM(\min)}$ $V_O=0$	$V^{\pm}=\pm 5V$ $V^{\pm}=\pm 15V$	60 70	79 87		dB
Large Signal Voltage Gain	A_V	$R_L = 2k\Omega$	$V^{\pm}=\pm 5V$, $V_O = \pm 2.3V$ $V^{\pm}=\pm 15V$, $V_O = \pm 10V$	75 80	95 100		dB
Output Voltage	V_O	$R_L = 10k\Omega$	V_{OH}	$V^+ - 3$	$V^+ - 1.1$		V
			V_{OL}		$V^+ + 4.2$	$V^+ + 3$	V
		$R_L = 2k\Omega$	V_{OH}	$V^+ - 3.5$	$V^+ - 2.3$		V
			V_{OL}		$V^+ + 3$	$V^+ + 4$	V

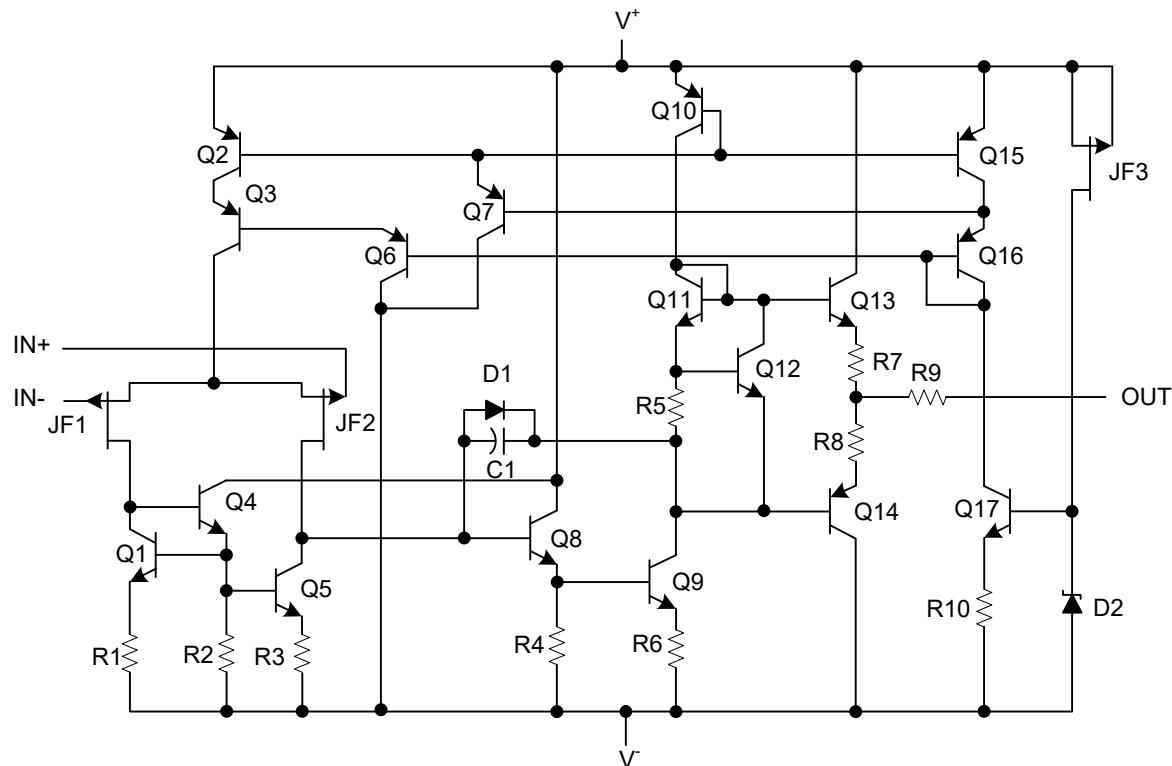
■ OPERATING CHARACTERISTICS ($V^+ - V^- = \pm 5 \sim 15V$, $T_A = 25^\circ C$ unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Positive Slew Rate	SR	$R_L = 2k\Omega$, $C_L = 100pF$, See Figure 1		13		V/ μ s
Input Noise Voltage	$e_{in\ p-p}$	$R_S = 20\Omega$, See Figure 3 $f = 10Hz \sim 10kHz$		4		μ V
Equivalent Input Noise Current	I_N	$f = 1kHz$		0.01		pA/ \sqrt{Hz}
Total Harmonic Distortion (Note 3)	THD	$R_S = 1k\Omega$, $f = 1kHz$, $R_L = 2k\Omega$		0.003		%
Gain Bandwidth Product	GBW	$V_i = 10mV$, $R_L = 2k\Omega$, $C_L = 25pF$, See Figure 4		2.7		MHz
Phase Margin	Φ_m	$V_i = 10mV$, $R_L = 2k\Omega$, $C_L = 25pF$, See Figure 4		64		deg

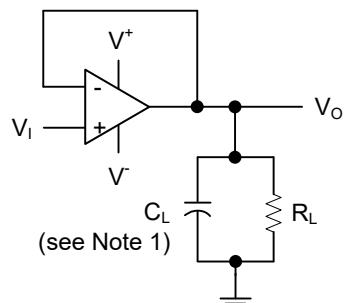
Notes: 1. For $V^\pm = \pm 5V$, $V_{I(PP)} = \pm 1V$; for $V^\pm = \pm 15V$, $V_{I(PP)} = \pm 5V$.

2. This parameter is tested on a sample basis. For other test requirements, please contact the factory. This statement has no bearing on testing or nontesting of other parameters.
3. For $V^\pm = \pm 5V$, $V_{O(RMS)} = 1V$; for $V^\pm = \pm 15V$, $V_{O(RMS)} = 6V$.

■ EQUIVALENT SCHEMATIC (EACH AMPLIFIER)



■ PARAMETER MEASUREMENT INFORMATION



Note 1: C_L includes fixture capacitance.

Figure 1. Slew Rate, Rise/Fall Time,
and Overshoot Test Circuit

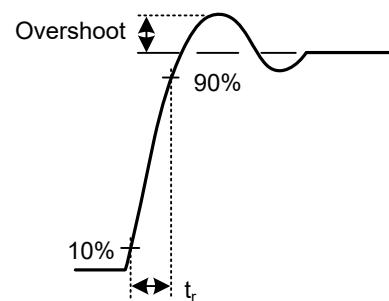


Figure 2. Rise-Time and Overshoot
Waveform

■ PARAMETER MEASUREMENT INFORMATION (Cont.)

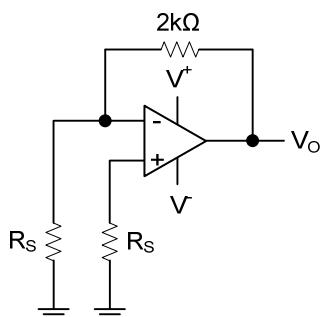
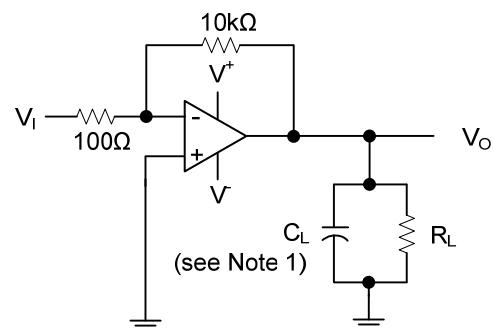


Figure 3. Noise-Voltage Test Circuit



Note 1: C_L includes fixture capacitance.

Figure 4. Unity-Gain Bandwidth and Phase-Margin Test Circuit

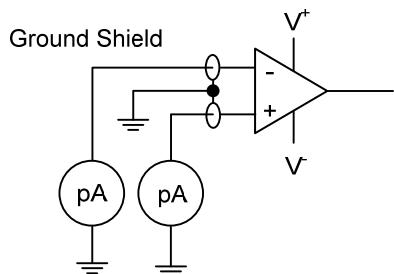
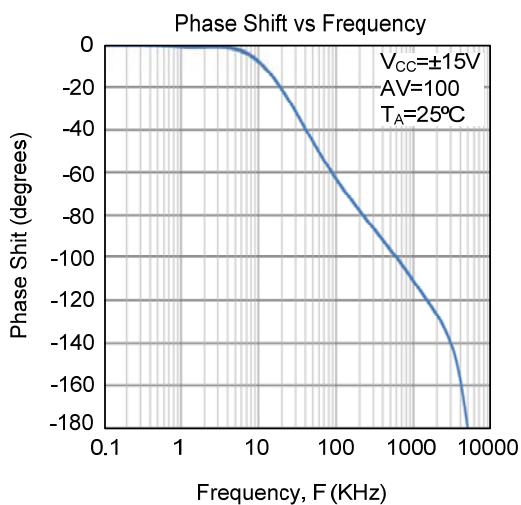
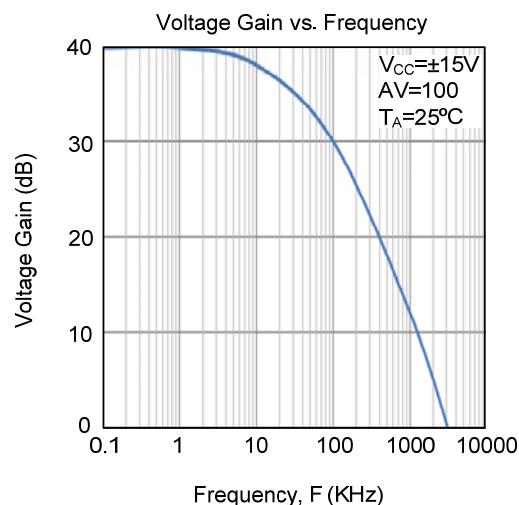
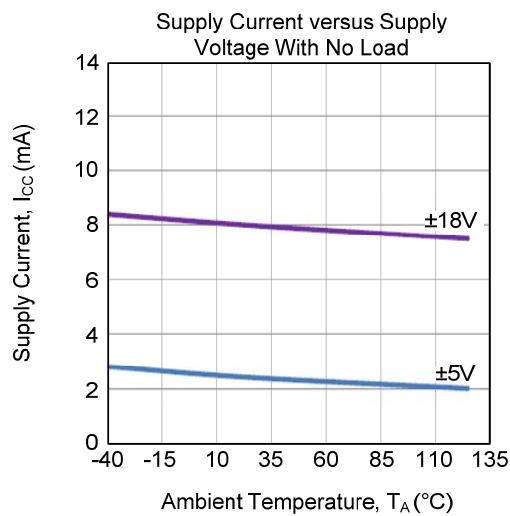
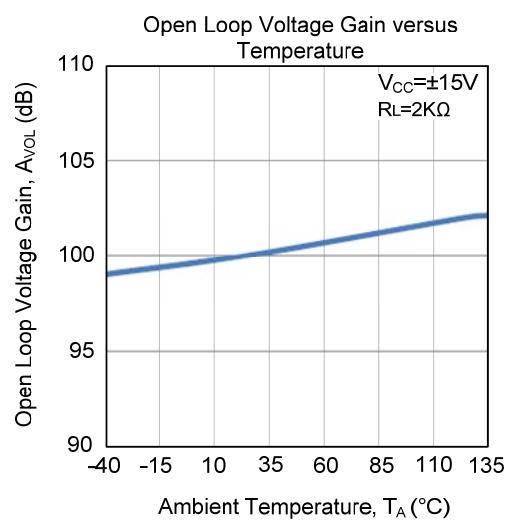
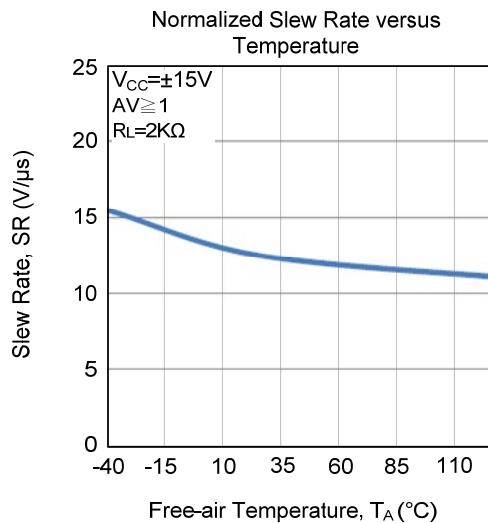


Figure 5. Input-Bias and Offset-Current Test Circuit

■ TYPICAL CHARACTERISTICS



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