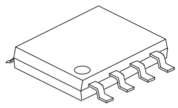
GENERAL-PURPOSE OPERATIONAL AMPLIFIER



SOP-8

■ DESCRIPTION

The UTC **LM741** device is a general-purpose operational amplifier featuring offset-voltage null capability.

The high common-mode input voltage range and the absence of latch-up make the amplifier ideal for voltage-follower applications. The device is short-circuit protected and the internal frequency compensation ensures stability without external components. A low-value potentiometer may be connected between the offset null inputs to null out the offset voltage as shown in Figure 2.

The UTC **LM741** device is characterized for operation from 0°C to 70°C.

■ FEATURES

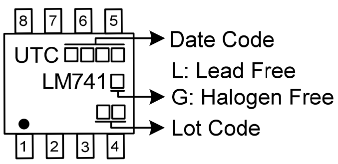
* Short-Circuit Protection
* Offset-Voltage Null Capability
* Large Common-Mode and Differential Voltage Ranges

■ RDERING INFORMATION

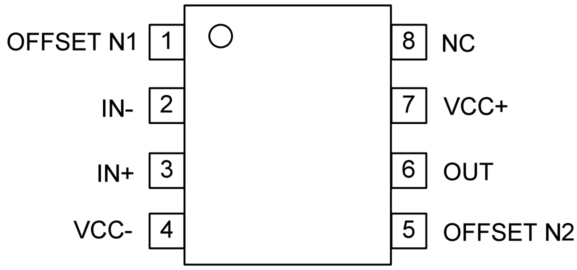
Ordering Number		Package	Packing
Lead Free	Halogen Free		
LM741L-S08-R	LM741G-S08-R	SOP-8	Tape Reel

LM741G-S08-R (1)Packing Type (2)Package Type (3)Green Package	(1) R: Tape Reel (2) S08: SOP-8 (3) G: Halogen Free and Lead Free, L: Lead Free

■ MARKING



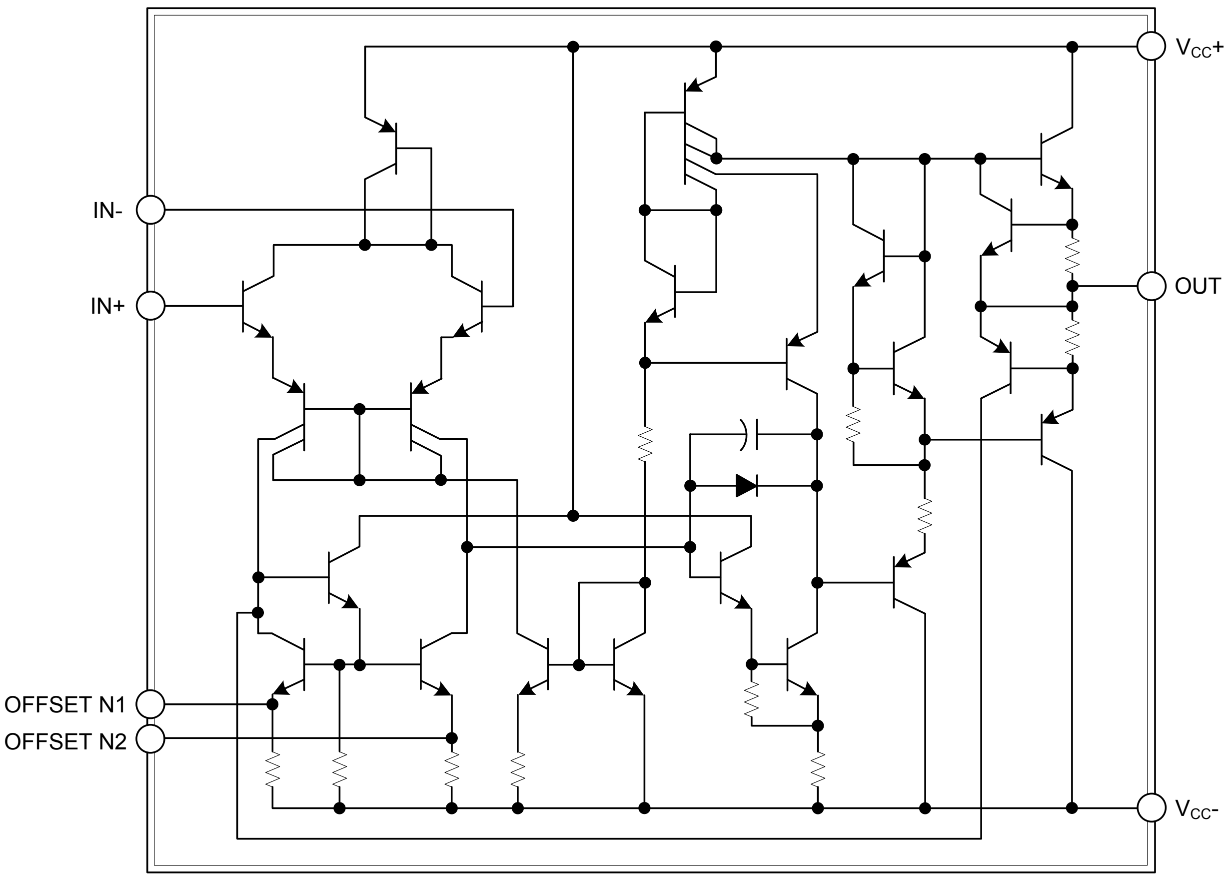
■ PIN CONFIGURATION



■ PIN DESCRIPTION

PIN NO.	PIN NAME	DESCRIPTION
1	OFFSET N1	External input offset voltage adjustment
2	IN-	Inverting input
3	IN+	Noninverting input
4	V_{CC}-	Negative supply
5	OFFSET N2	External input offset voltage adjustment
6	OUT	Output
7	V_{CC}+	Positive supply
8	NC	No internal connection

■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATING (Unless otherwise specified)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage (Note 1)	V_{CC}	-18 ~ 18	V
Differential Input Voltage (Note 2)	V_{ID}	-15 ~ 15	V
Input Voltage (any Input) (Note 1, 3)	V_I	-15 ~ 15	V
Voltage between Offset Null (either OFFSET N1 or OFFSET N2) and V_{CC}-		-15 ~ 15	V
Duration of Output Short Circuit (Note 4)		Unlimited	
Lead Temperature 1.6 mm (1/16 inch) from Case for 10 Seconds	T_L	260	°C
Operating Junction Temperature	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. All voltage values, unless otherwise noted, are with respect to the midpoint between V_{CC}+ and V_{CC}-.
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
5. The output may be shorted to ground or either power supply.

■ RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT
Supply Voltage	V_{CC+}	5		15	V
	V_{CC-}	-5		-15	V
Operating Free-Air Temperature	T_A	0		+70	°C

■ THERMAL INFORMATION

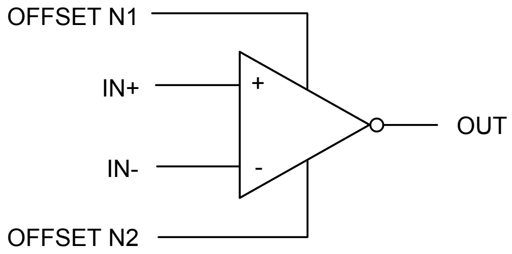
PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient	θ_{JA}	158	°C/W

■ ELECTRICAL CHARACTERISTICS

(At specified virtual junction temperature, $V_{CC}\pm$ = ±15V, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS		MIN	TYP	MAX	UNIT
POWER SUPPLY							
Supply Current	I_Q	V_O = 0, No Load	T_A=25°C		1.7	2.8	mA
			T_A=0~70°C			3.3	mA
Power Supply Rejection Ratio	PSRR	V_{CC} = ±9V to ±15V	T_A=25°C	80	95		dB
			T_A=0~70°C	80			dB
Total Power Dissipation	P_D	V_O = 0, No Load	T_A=25°C		50	85	mW
			T_A=0~70°C			100	mW
INPUT CHARACTERISTICS							
Input Offset Voltage	V_{OS}	V_O=0	T_A=25°C		1	6	mV
			T_A=0~70°C			7.5	mV
Input Offset Voltage Adjust Range	$\Delta V_{OS(adj)}$	V_O=0, T_A=25°C			±15		mV
Input Bias Current	I_B	V_O=0	T_A=25°C		80	500	nA
			T_A=0~70°C			800	nA
Input Offset Current	I_{OS}	V_O=0	T_A=25°C		20	200	nA
			T_A=0~70°C			300	nA
Common-Mode Voltage Range	V_{CM}	T_A=25°C		±12	±13		V
		T_A=0~70°C		±12			V
Common-Mode Rejection Ratio	CMRR	V_{CM} = $V_{CM\ min}$	T_A=25°C	70	90		dB
			T_A=0~70°C	70			dB
Large Signal Voltage Gain	A_V	R_L ≥ 2kΩ	T_A=25°C	85	100		dB
		V_O= ±10V	T_A=0~70°C	82			dB
Input Resistance	r_i	T_A=25°C			2		MΩ
Input Capacitance	Ci	TA=25°C			1.4		pF
OUTPUT CHARACTERISTICS							
Maximum Peak Output Voltage Swing	V_{OM}	R_L =10kΩ	T_A=25°C	±12	±14		V
		R_L ≥ 10kΩ	T_A=0~70°C	±12			V
		R_L = 2kΩ	T_A=25°C	±10			V
		R_L ≥ 2kΩ	T_A=0~70°C	±10			V
Short-Circuit Output Current	I_{OS}	T_A=25°C			±20	±40	mA
Output Resistance	r_o	V_O = 0, T_A=25°C (Note 2)			75		Ω
DYNAMIC PERFORMANCE							
Slew Rate	SR	V_I =10V, R_L =2kΩ C_L =100pF, see Figure 1			0.5		V/μs
Rise Time	t_r	V_I=20mV, R_L=2kΩ C_L =100pF, see Figure 1			0.3		μs
Overshoot Factor					5		%

■ SIMPLIFIED SCHEMATIC



■ TYPICAL CHARACTERISTICS

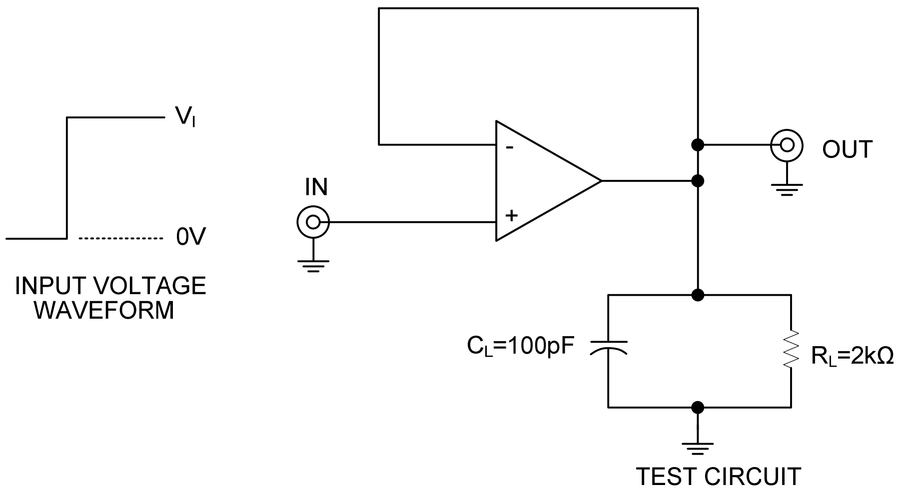


Figure 1. Rise Time, Overshoot, and Slew Rate

The input offset voltage of operational amplifiers (op amps) arises from unavoidable mismatches in the differential input stage of the op-amp circuit caused by mismatched transistor pairs, collector currents, current-gain betas (β), collector or emitter resistors and so forth. The input offset pins allow the designer to adjust for mismatches resulting from external circuitry. These input mismatches can be adjusted by placing resistors or a potentiometer between the inputs as shown in Figure 2. A potentiometer can fine-tune the circuit during testing or for applications which require precision offset control.

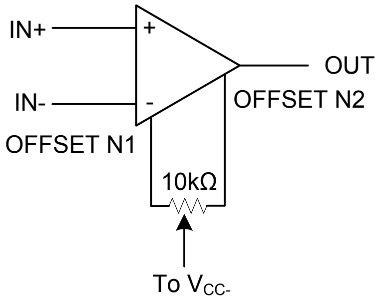


Figure 2. Input Offset Voltage Null Circuit

■ TYPICAL APPLICATION

The voltage follower configuration of the operational amplifier is used for applications where a weak signal drives a relatively high current load. This circuit is also called a buffer amplifier or unity-gain amplifier. The inputs of an operational amplifier have a very high resistance which puts a negligible current load on the voltage source. The output resistance of the operational amplifier is almost negligible, so the resistance can provide as much current as necessary to the output load.

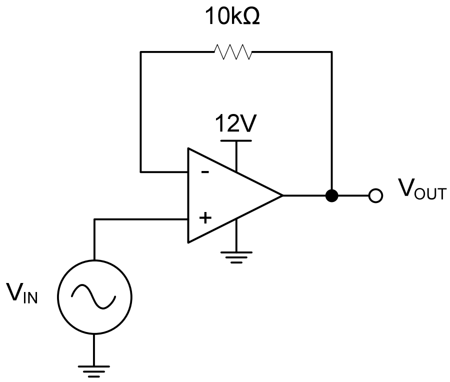


Figure 3. Voltage Follower Schematic