

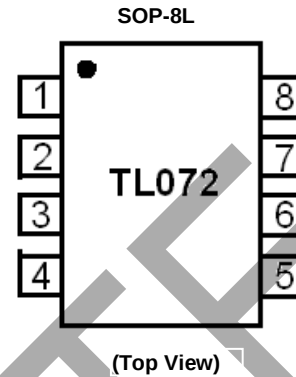
LOW NOISE JFET INPUT OPERATIONAL AMPLIFIERS
General Description

The JFET-input operational amplifiers in the TL072 are similar to the TL082, with low input bias and offset currents and fast slew rate. The low harmonic distortion and low noise make the TL072 ideally suited for high-fidelity and audio preamplifier applications.

Each amplifier features JFET inputs (for high input impedance) coupled with bipolar output stages integrated on a single monolithic chip.

Features

- Low Power Consumption
- Wide Common-Mode and Differential Voltage Ranges
- Low Input Bias and Offset Currents
- Output Short-Circuit Protection
- Low Total Harmonic Distortion...0.003% typ
- Low Noise $V_n = 18\text{nV}/\sqrt{\text{Hz}}$ typ at $f = 1\text{kHz}$
- High Input Impedance...JFET-Input Stage
- Internal Frequency Compensation
- Latch-Up-Free Operation
- High Slew Rate...13V/ μs typ
- Common-Mode Input Voltage Range Includes V_{CC+}
- SOP-8L: Available in "Green" Molding Compound (No Br, Sb)
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- For automotive applications requiring specific change control (i.e. parts qualified to AEC-Q100/101/104/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please [contact us](#) or your local Diodes representative.
<https://www.diodes.com/quality/product-definitions/>

Pin Assignments

Applications

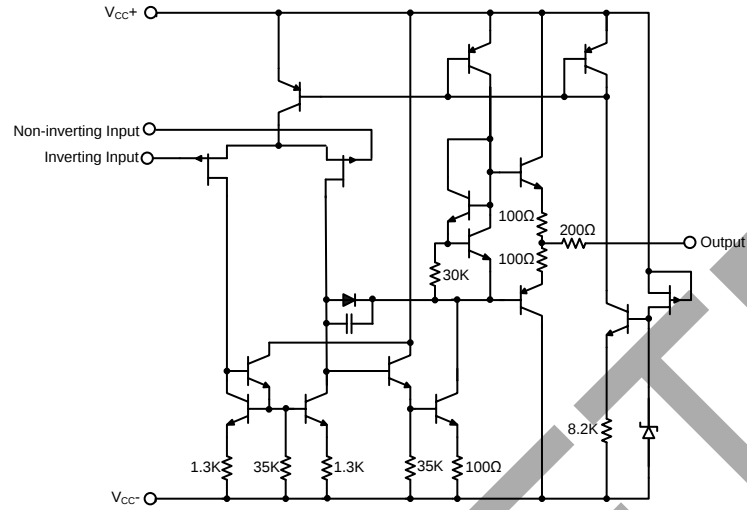
- Active filters
- Audio pre-amps

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
 2. See <https://www.diodes.com/quality/lead-free/> for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
 3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.

Pin Descriptions

Pin Name	Pin No.	Description
OUTPUT1	1	Channel 1 Output
INVERTING INPUT1	2	Channel 1 Inverting Input
NON-INVERTING INPUT1	3	Channel 1 Non-inverting Input
V_{CC-}	4	Supply Voltage
NON-INVERTING INPUT2	5	Channel 2 Non-inverting Input
INVERTING INPUT2	6	Channel 2 Inverting Input
OUTPUT2	7	Channel 2 Output
V_{CC+}	8	Supply Voltage

Functional Block Diagram



Absolute Maximum Ratings (Note 9)

Symbol	Parameter	Rating	Unit
ESD HBM	Human Body Model ESD Protection	1	kV
ESD MM	Machine Model ESD Protection	200	V
VCC+	Supply Voltage + (Note 4)	+18	V
VCC-	Supply Voltage - (Note 4)	-18	V
VI	Input Voltage (Notes 4 and 6)	±15	V
VID	Differential Input Voltage, VID (Note 5)	±30	V
—	Duration of Output Short Circuit (Note 7)	Unlimited	—
PD	Power Dissipation (Note 8)	860	mW
TJ	Operating Junction Temperature Range	+150	°C
TST	Storage Temperature Range	-65 to +150	°C

Recommended Operating Conditions (Note 9)

Symbol	Description	Rating	Unit
VCC±	Supply Voltage	±15	V
TA	Operating Ambient Temperature Range	-40 to +85	°C

Notes:

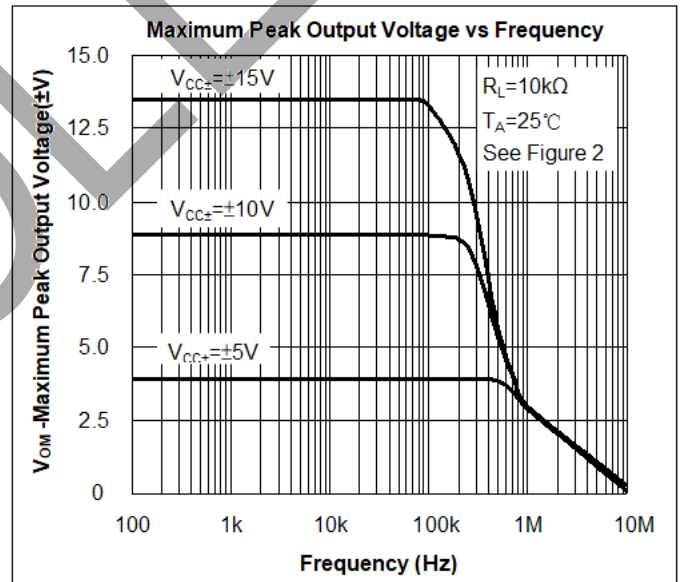
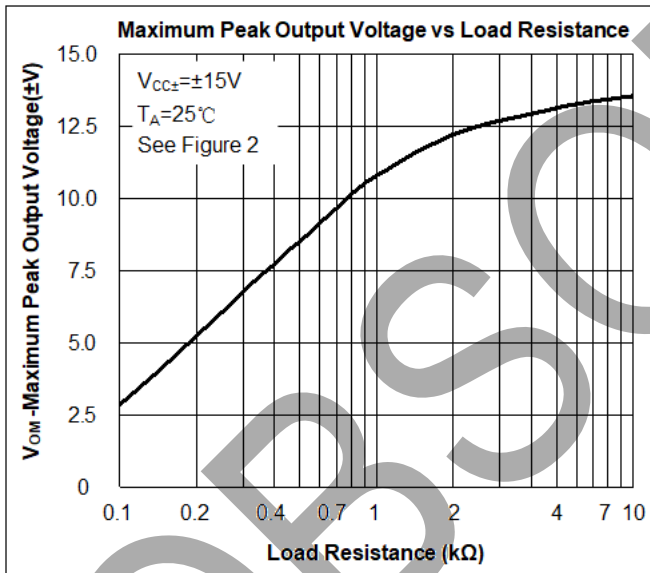
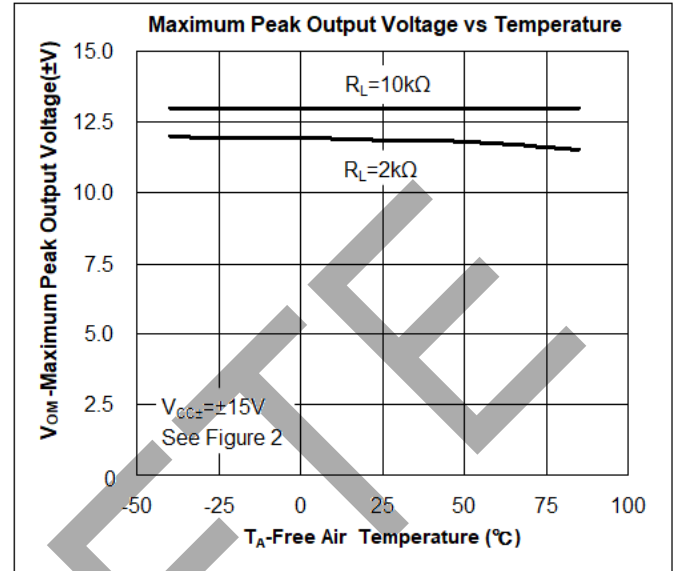
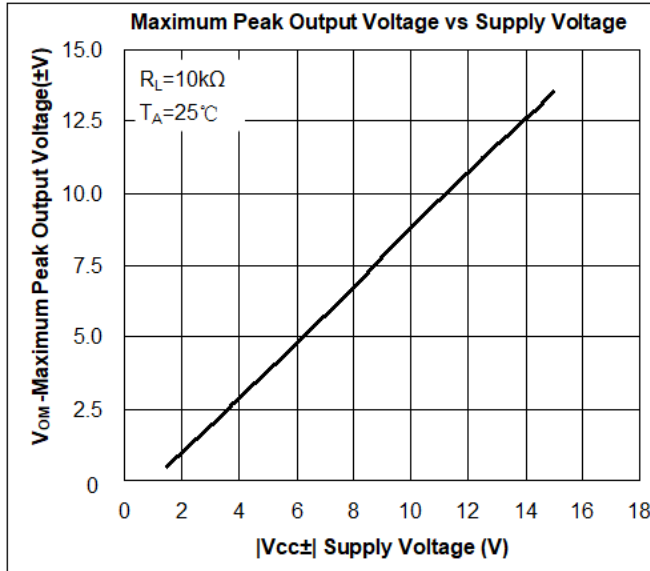
- All voltage values, except differential voltages, are with respect to the midpoint between VCC+ and VCC-.
- Differential voltage are at the non-inverting input terminal with respect to the inverting input terminal.
- The magnitude of the input voltage must never exceed the magnitude of the supply voltage or 15V, whichever is less.
- The output may be shorted to ground or either supply. Temperature and/or supply voltage must be limited to ensure that the dissipation rating is not exceeded.
- Maximum power dissipation is a function of TJ(max), θJA, and TA. The maximum allowable power dissipation at any allowable ambient temperature is PD = (TJ(max) - TA) / θJA. Operating at the absolute maximum TJ of +150°C can affect reliability.
- Absolute Maximum Ratings indicate limits beyond which damage to the device can occur. Recommended Operating Conditions indicate conditions for which the device is intended to be functional, but specific performance is not guaranteed. For guaranteed specifications and the test conditions, see the Electrical Characteristics.

Electrical Characteristics (@ $V_{CC\pm} = \pm 15V$, $T_A = +25^\circ C$, unless otherwise specified.)

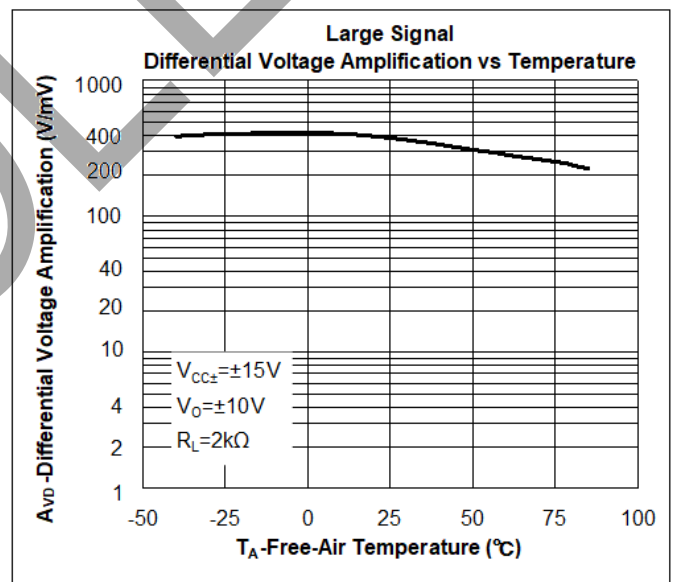
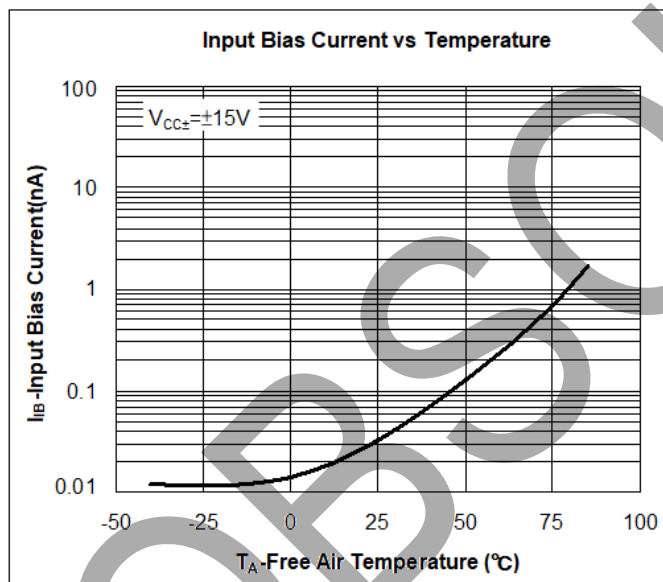
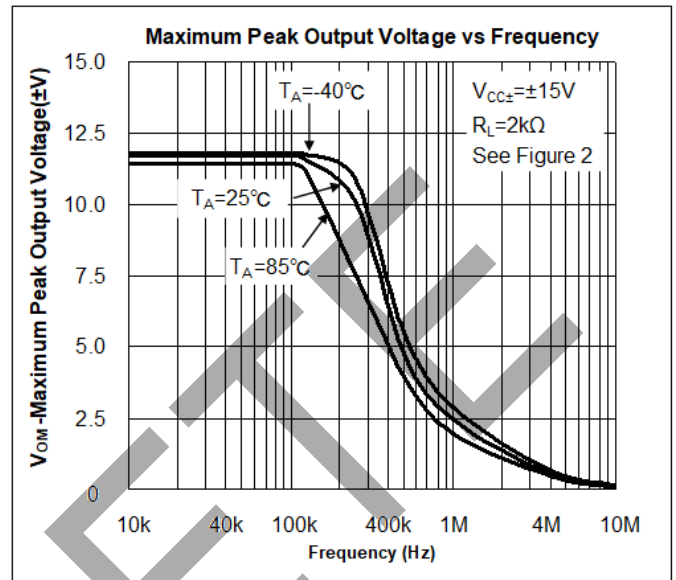
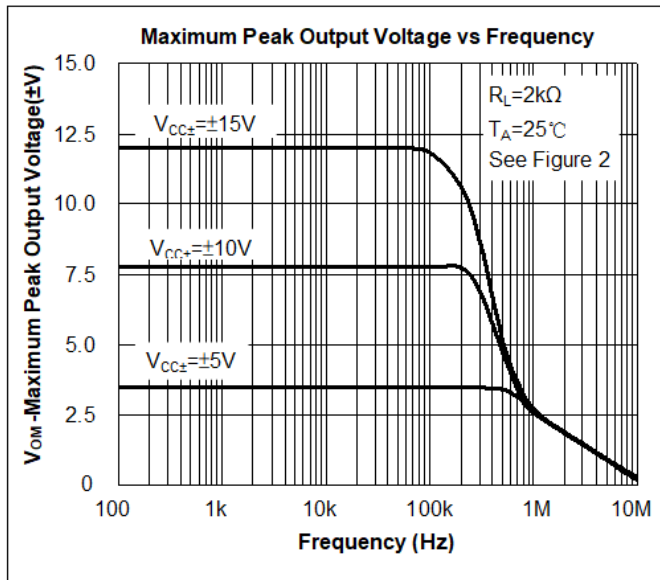
Symbol	Parameter	Test Conditions		Min	Typ.	Max	Unit
V_{IO}	Input Offset Voltage	$V_O = 0$, $R_S = 50\Omega$	$T_A = +25^\circ C$ $T_A = \text{full range}$	— —	3 —	6 8	mV
$^aV_{IO}$	Temperature Coefficient of Input Offset Voltage	$V_O = 0$, $R_S = 50\Omega$, $T_A = \text{full range}$		—	—	—	$\mu V/^\circ C$
I_{IO}	Input Offset Current	$V_O = 0$	$T_A = +25^\circ C$ $T_A = \text{full range}$	— —	5 —	100 2	pA nA
I_{IB}	Input Bias Current	$V_O = 0$	$T_A = +25^\circ C$ $T_A = \text{full range}$	— —	65 —	200 20	pA nA
V_{ICR}	Common Mode Input Voltage Range	—		± 11	-12 to +15	—	V
V_{OM}	Maximum Peak Output Voltage Swing	$R_L = 10k\Omega$, $T_A = +25^\circ C$		± 12	± 13.5	—	V
		$R_L \geq 10k\Omega$	$T_A = \text{full range}$	± 12	—	—	
		$R_L \geq 2k\Omega$		± 10	—	—	
A_{VD}	Large Signal Differential Voltage Amplification	$V_O = \pm 10V$, $R_L \geq 2k\Omega$	$T_A = +25^\circ C$	50	—	—	V/mV
			$T_A = \text{full range}$	25	—	—	
B_1	Unity Gain Bandwidth	—		—	3	—	MHz
r_i	Input Resistance	$T_A = +25^\circ C$		—	10^{12}	—	Ω
CMRR	Common Mode Rejection Ratio	$V_{IC} = V_{ICRmin}$, $V_O = 0$ $R_S = 50\Omega$, $T_A = +25^\circ C$		75	100	—	dB
k_{SVR}	Supply Voltage Rejection Ratio ($\Delta V_{CC\pm}/\Delta V_{IO}$)	$V_{CC} = \pm 9$ to $\pm 15V$ $V_O = 0$ $R_S = 50\Omega$, $T_A = +25^\circ C$		80	100	—	dB
I_{CC}	Supply Current (each amplifier)	$V_O = 0$, $T_A = +25^\circ C$ No load		—	1.4	2.5	mA
V_{O1}/V_{O2}	Crosstalk Attenuation	$A_{VD} = 100$, $T_A = +25^\circ C$		—	120	—	dB
SR	Slew Rate at Unity Gain	$V_I = 10V$, $C_L = 100pF$, $R_L = 2k\Omega$ (See Figure 1)		8	13	—	V/ μs
t_r	Rise Time	$V_I = 20mV$, $R_L = 2k\Omega$, $C_L = 100pF$ (See Figure 1)		—	0.1	—	μs
—	Overshoot Factor	(See Figure 1)		—	20	—	%
V_n	Equivalent Input Noise Voltage	$R_S = 20\Omega$	—	—	—	—	$nV/\sqrt{Hz}$
			—	—	—	—	μV
I_n	Equivalent Input Noise Current	$R_S = 20\Omega$, $f = 1kHz$		—	0.01	—	$pA/\sqrt{Hz}$
THD	Total Harmonic Distortion	$V_{rms} = 6V$, $A_{VD} = 1$, $R_L \geq 2k\Omega$, $R_S \leq 1k\Omega$, $f = 1kHz$		—	0.003	—	%
θ_{JA}	Thermal Resistance Junction-to-Ambient	SOP-8L (Note 10)		—	145	—	$^\circ C/W$
θ_{JC}	Thermal Resistance Junction-to-Case	SOP-8L (Note 10)		—	35	—	$^\circ C/W$

Note: 10. Test condition for SOP-8L: Devices mounted on FR-4 substrate PC board, with minimum recommended pad layout.

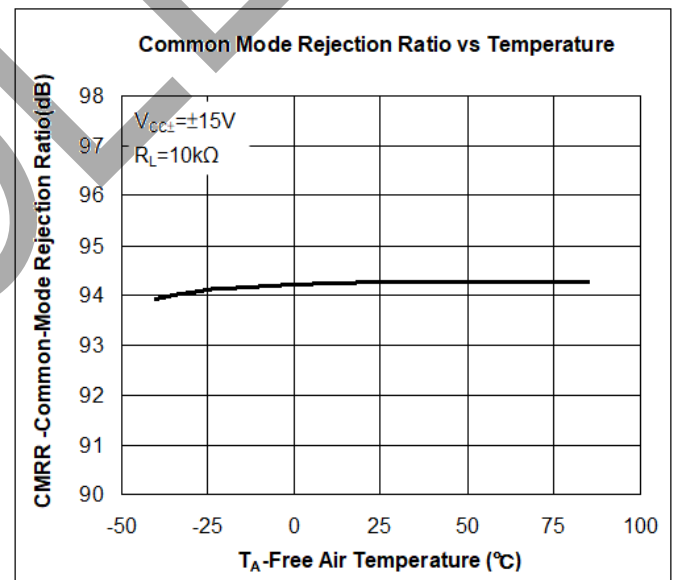
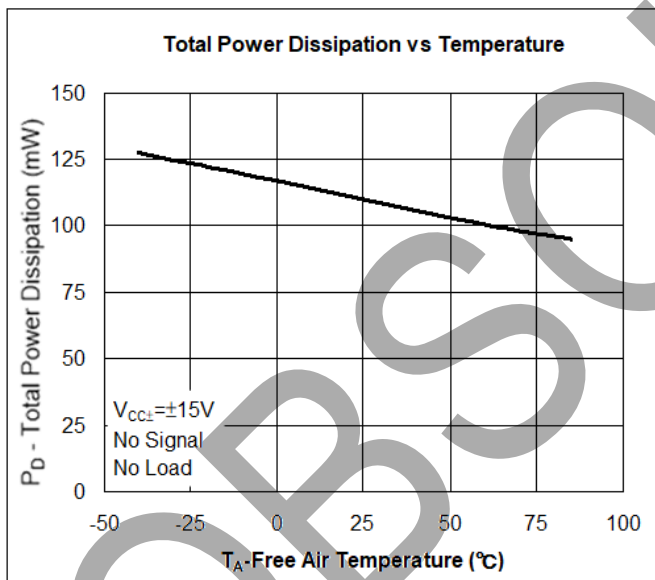
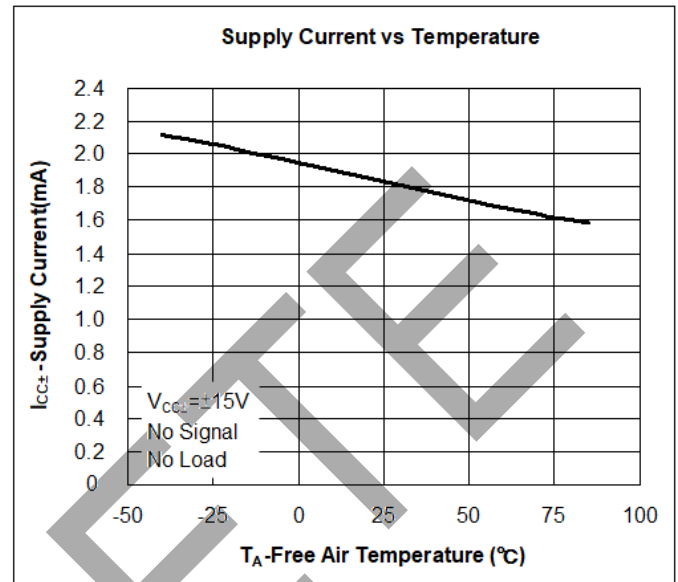
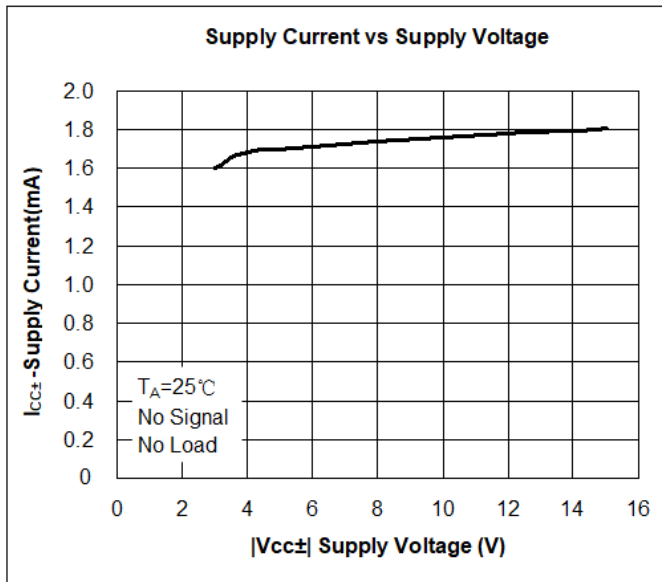
Typical Performance Characteristics



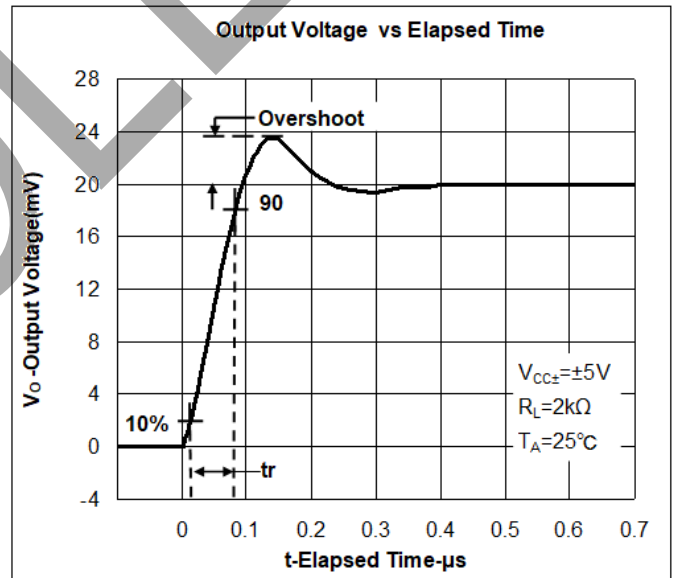
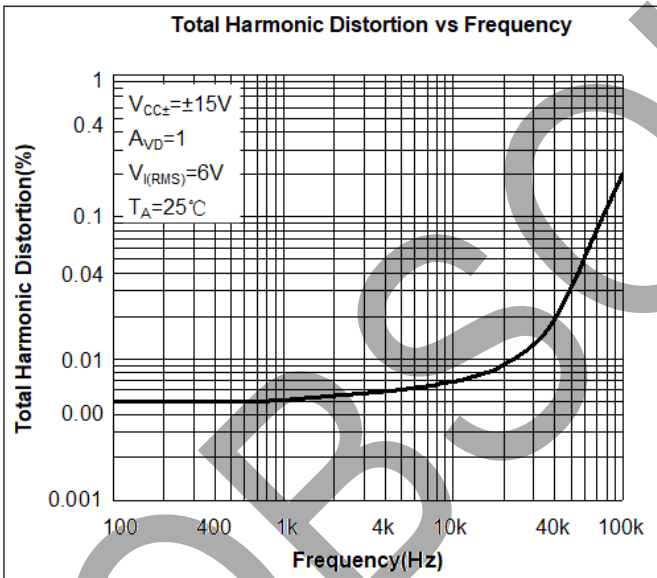
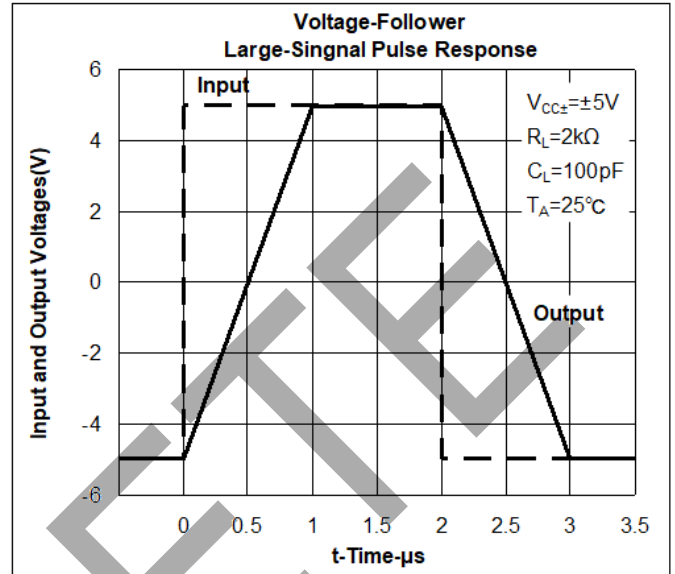
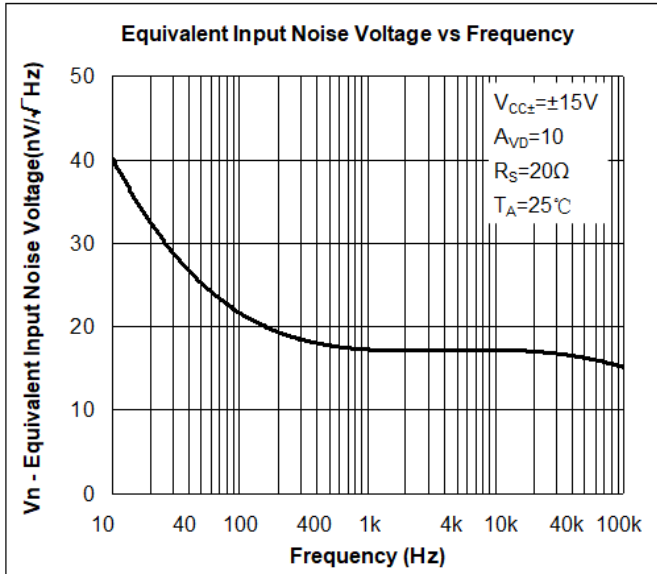
Typical Performance Characteristics (continued)



Typical Performance Characteristics (continued)



Typical Performance Characteristics (continued)



Test Circuit

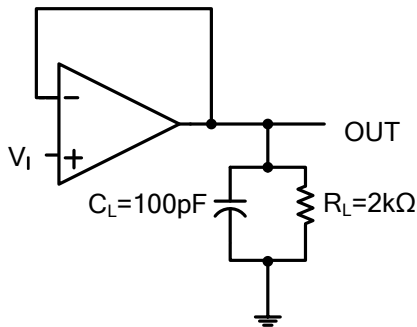


Figure 1. Unity-Gain Amplifier

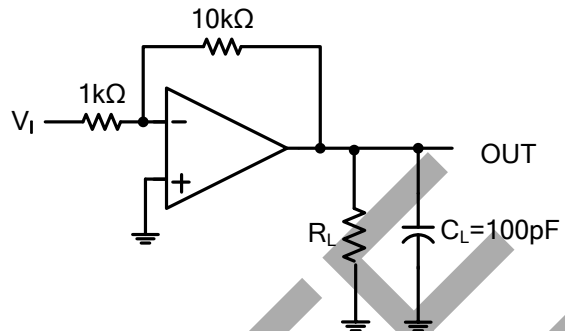
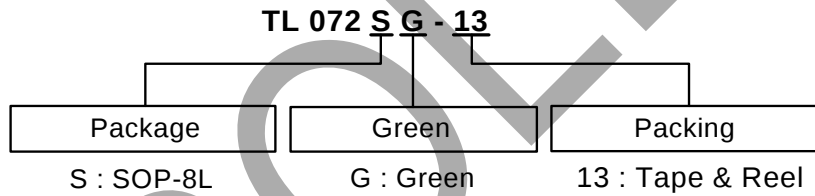


Figure 2. Gain-of-10 Inverting Amplifier

Ordering Information

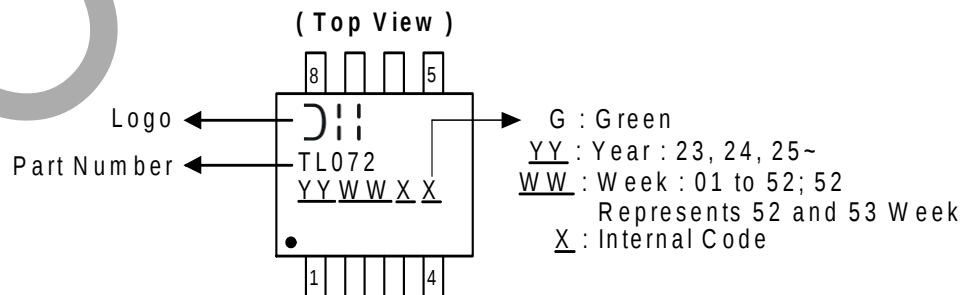


Part Number	Package Code	Package (Note 11)	Packing	
			Qty.	Carrier
TL072SG-13	S	SOP-8L	2500	13" Tape and Reel

Note: 11. For packaging details, go to our website at <https://www.diodes.com/design/support/packaging/diodes-packaging/>.

Marking Information

SOP-8L



Please see <http://www.diodes.com/package-outlines.html> for the latest version.

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