Lead-free Green

TL072

LOW NOISE JFET INPUT OPERATIONAL AMPLIFIERS

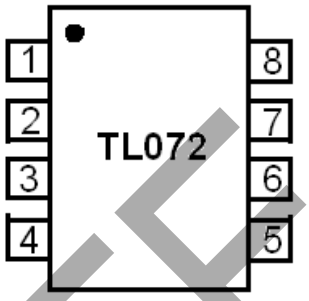
General Description

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.

Pin Assignments

SOP-8L



(Top View)

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 Vn = $18nV/\sqrt{HZ}$ typ at f = 1kHz
- 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/**

Applications

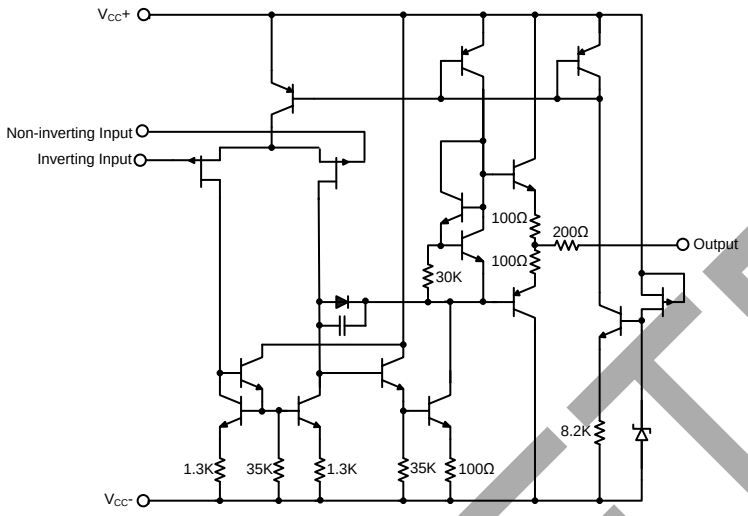
- Active filters
- Audio pre-amps

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
V_{CC}±	Supply Voltage	±15	V
T_A	Operating Ambient Temperature Range	-40 to +85	°C

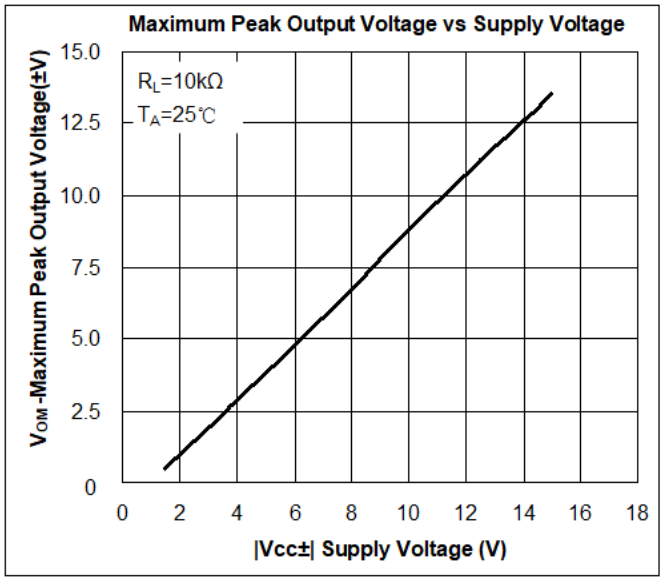
Notes:
4. All voltage values, except differential voltages, are with respect to the midpoint between V_{CC}+ and V_{CC}-.
5. Differential voltage are at the non-inverting input terminal with respect to the inverting input terminal.
6. The magnitude of the input voltage must never exceed the magnitude of the supply voltage or 15V, whichever is less.
7. 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.
8. Maximum power dissipation is a function of $T_{J(max)}$, θ_{JA}, and T_A. The maximum allowable power dissipation at any allowable ambient temperature is $P_D = (T_{J(max)}-T_A)/\theta_{JA}$. Operating at the absolute maximum T_J of +150℃ can affect reliability.
9. 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.

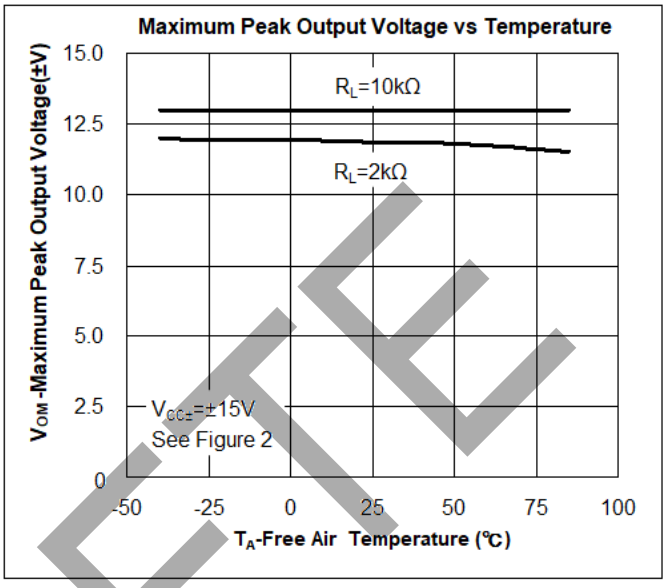
Electrical Characteristics (@ $V_{CC\pm}$ = ±15V, T_A = +25°C, unless otherwise specified.)

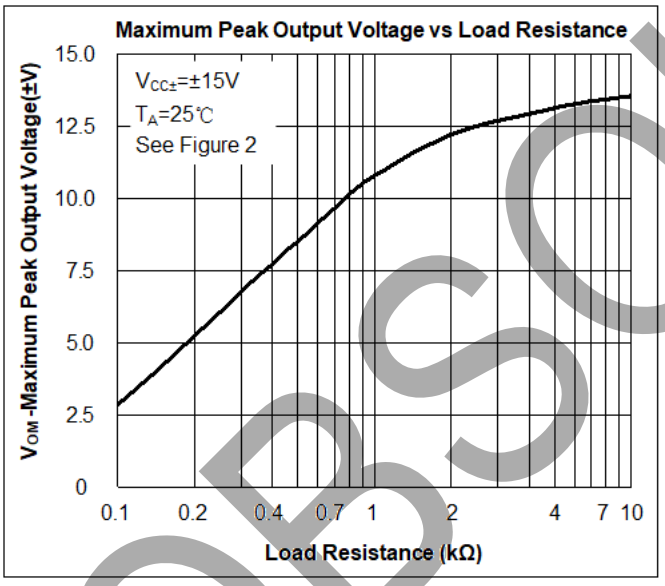
Symbol	Parameter	Test Conditions		Min	Typ.	Max	Unit
V_{IO}	Input Offset Voltage	V_O = 0, R_S = 50Ω	T_A = +25 °C	—	3	6	mV
			T_A = full range	—	—	8	
$^{\alpha}V_{IO}$	Temperature Coefficient of Input Offset Voltage	V_O = 0, R_S = 50Ω, T_A = full range		—	—	—	μV/ °C
I_{IO}	Input Offset Current	V_O = 0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

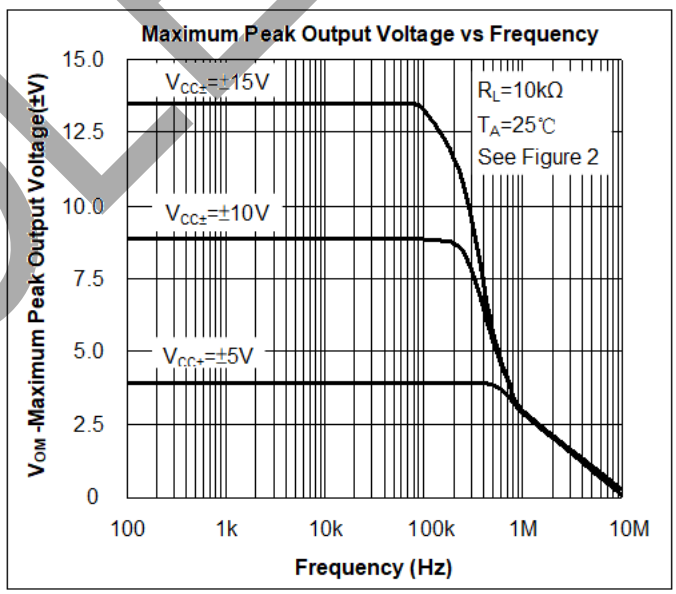
Note: 10. Test condition for SOP-8L: Devices mounted on FR-4 substrate PC board, with minimum recommended pad layout.

Typical Performance Characteristics









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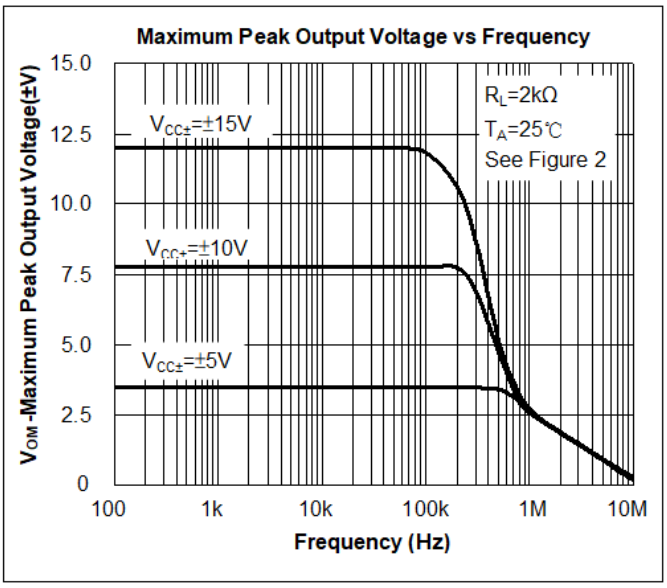
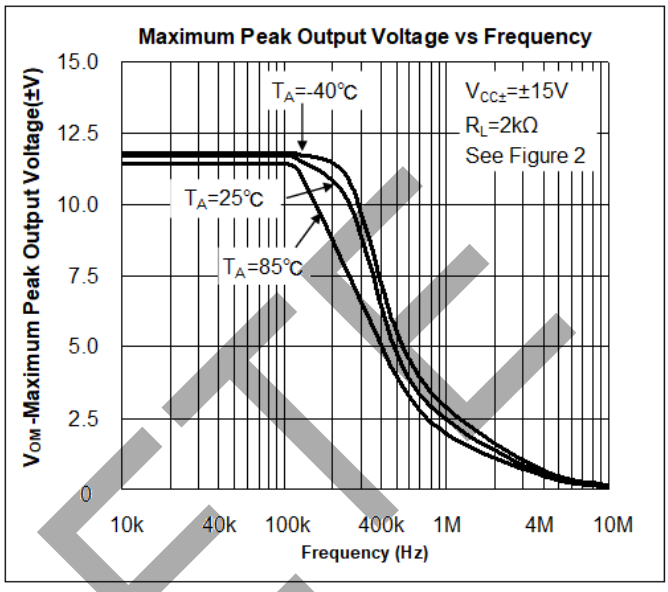
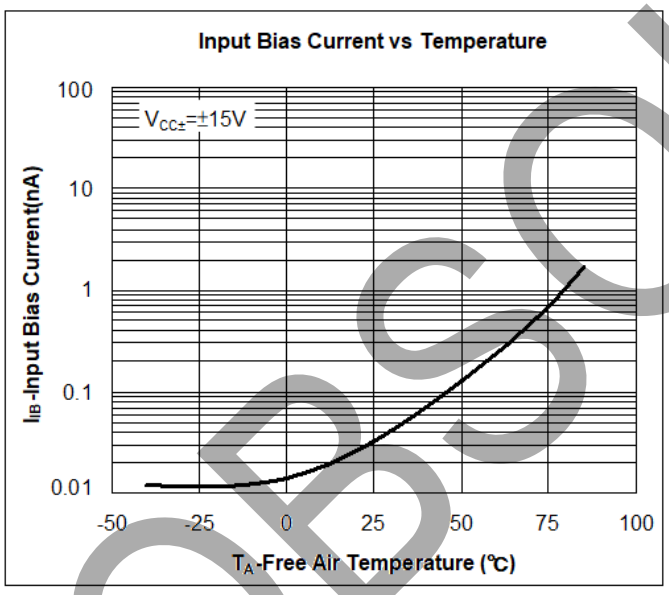
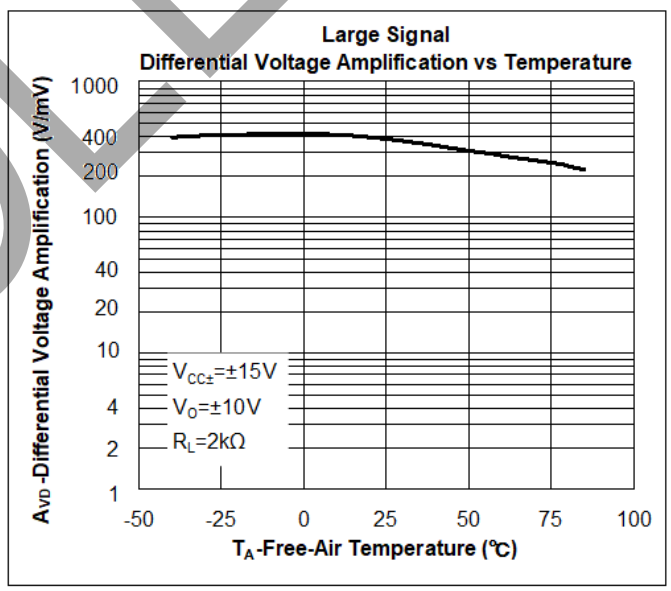
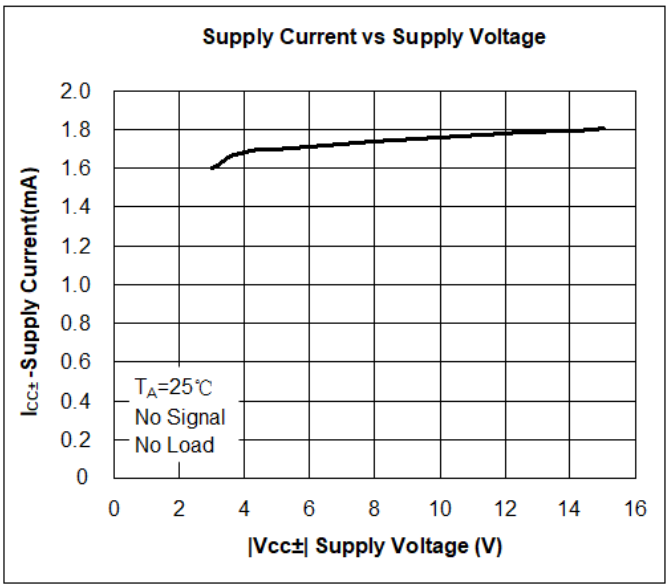


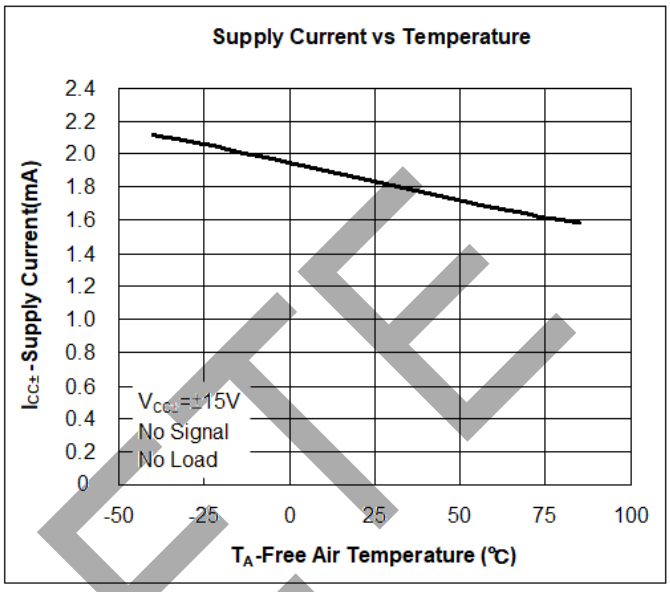


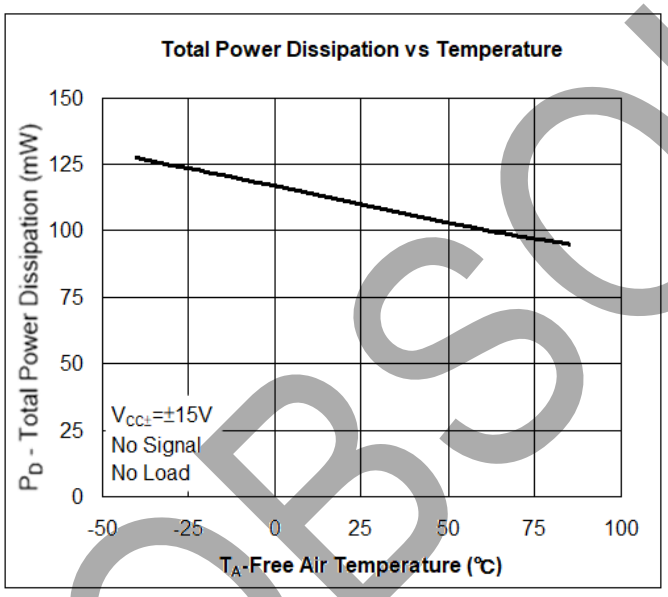


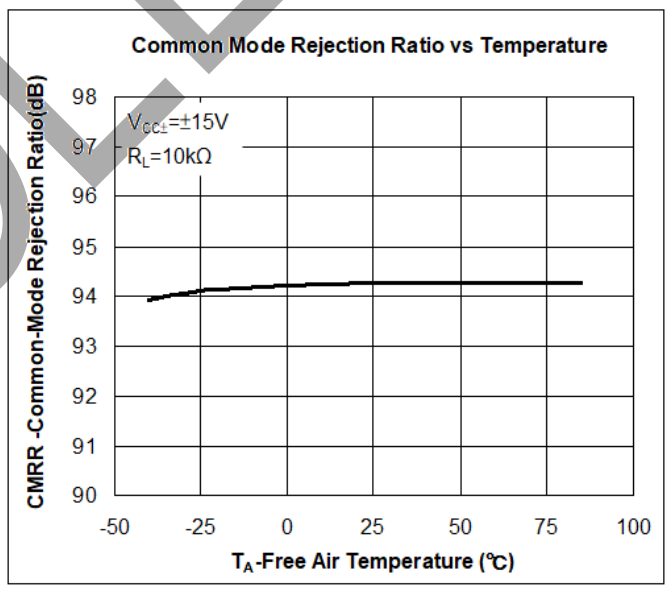


Typical Performance Characteristics (continued)

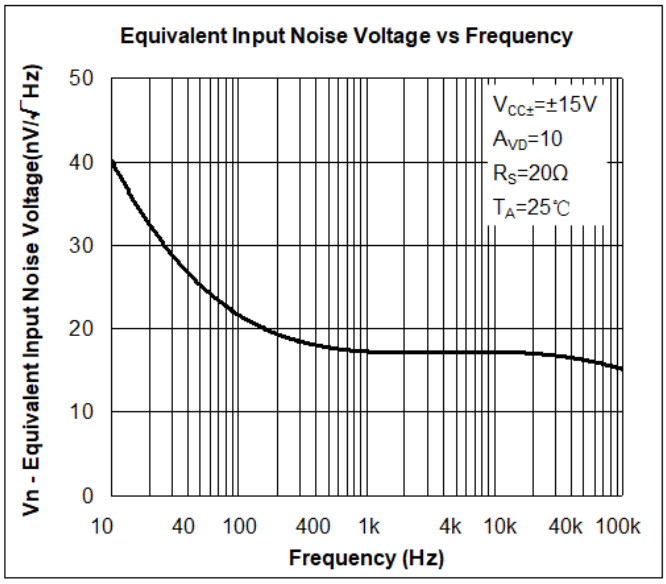


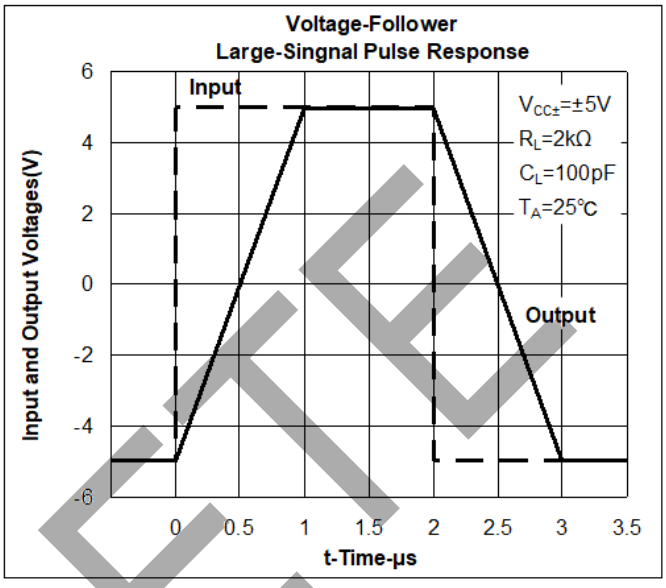


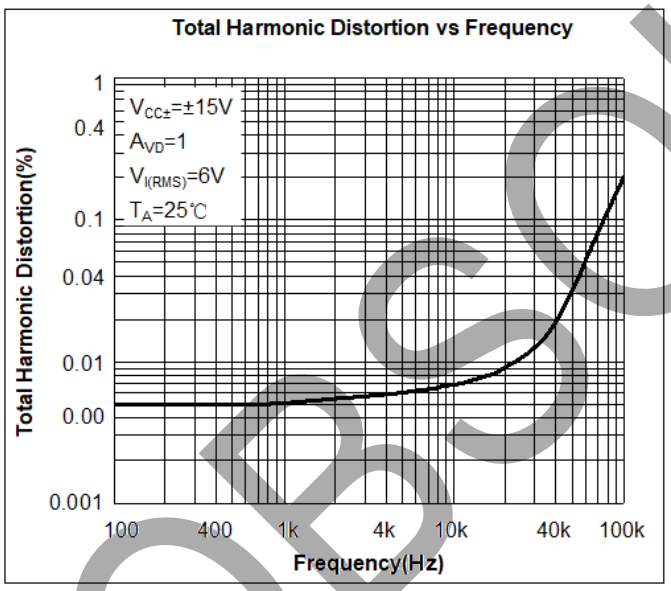


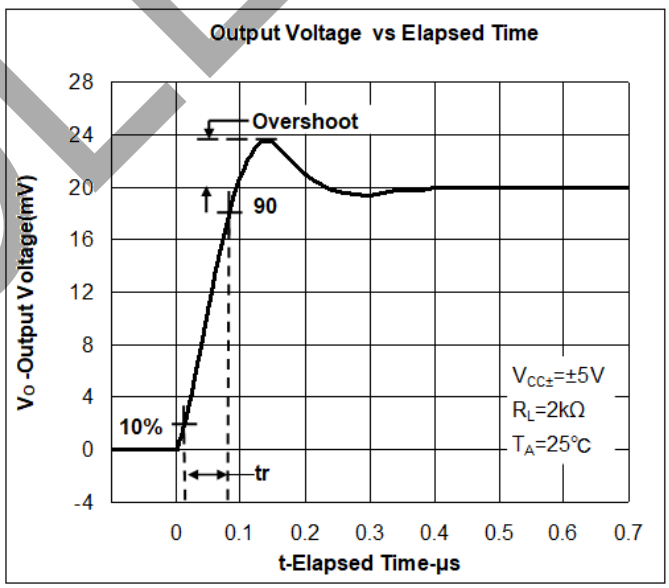


Typical Performance Characteristics (continued)









Test Circuit

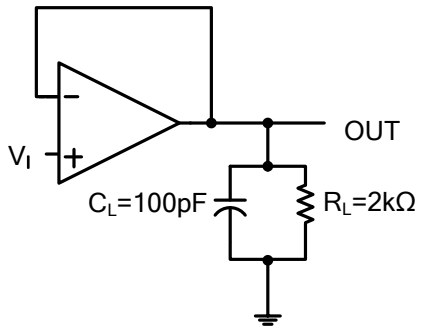


Figure 1. Unity-Gain Amplifier

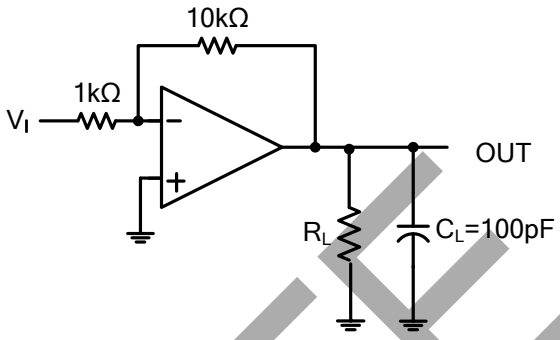
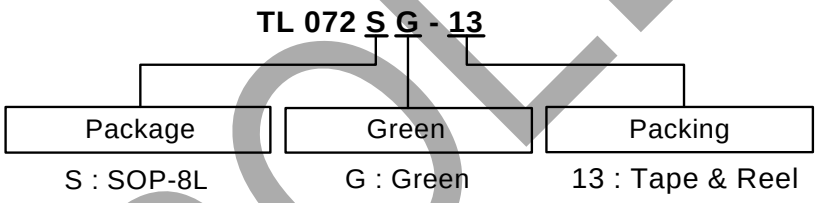


Figure 2. Gain-of-10 Inverting Amplifier

Ordering Information

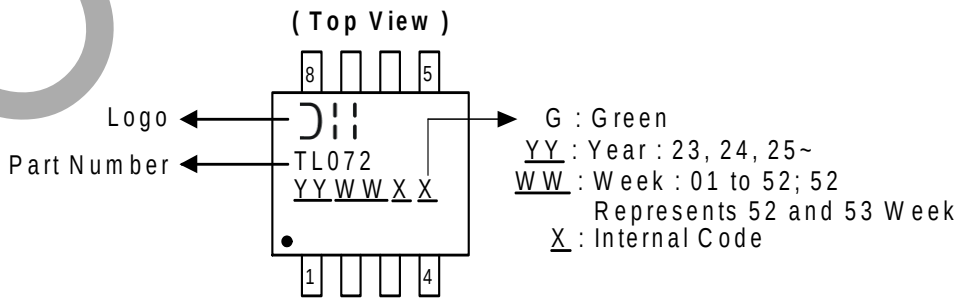


Part Number	Package Code	Package (Note 11)	Packing	
			Qty.	Carrier
TL072SG-13	S	SOP-8L	2500	13" Tape and Reel

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

Marking Information

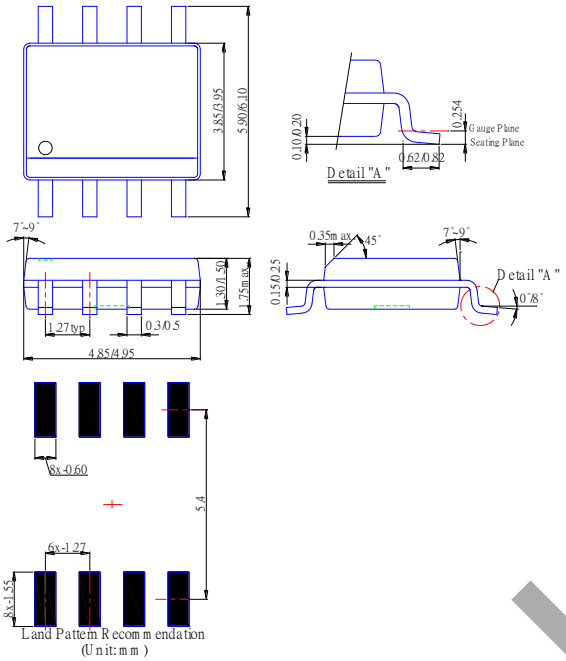
SOP-8L



Package Outline Dimensions (All Dimensions in mm)

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

SOP-8L



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