



TL072

LINEAR INTEGRATED CIRCUIT

LOW NOISE DUAL J-FET OPERATIONAL AMPLIFIER

DESCRIPTION

The UTC **TL072** 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.

FEATURES

- * Low power consumption
- * Wide common-mode (up to V_{CC+}) and differential voltage range
- * Low input bias and offset current
- * Low noise $e_n = 15nV / \sqrt{Hz}$ (typ.)
- * Output short-circuit protection
- * High input impedance J-FET input stage
- * Low harmonic distortion:0.01% (typ.)
- * Internal frequency compensation
- * Latch up free operation
- * High slewrate:16V/ μs (typ.)

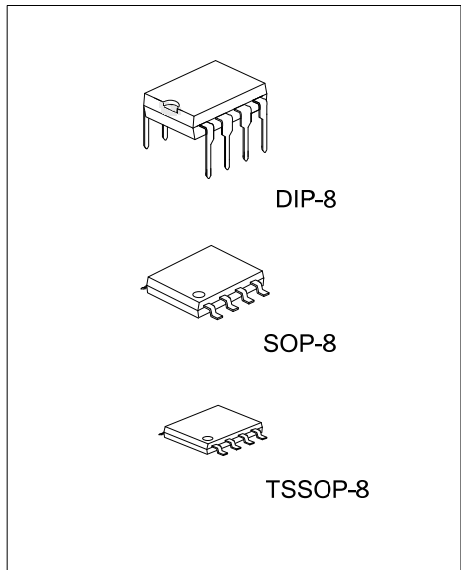
ORDERING INFORMATION

Ordering Number		Package	Packing
Lead Free	Halogen Free		
TL072L-D08-T	TL072G-D08-T	DIP-8	Tube
TL072L-S08-R	TL072G-S08-R	SOP-8	Tape Reel
TL072L-P08-R	TL072G-P08-R	TSSOP-8	Tape Reel

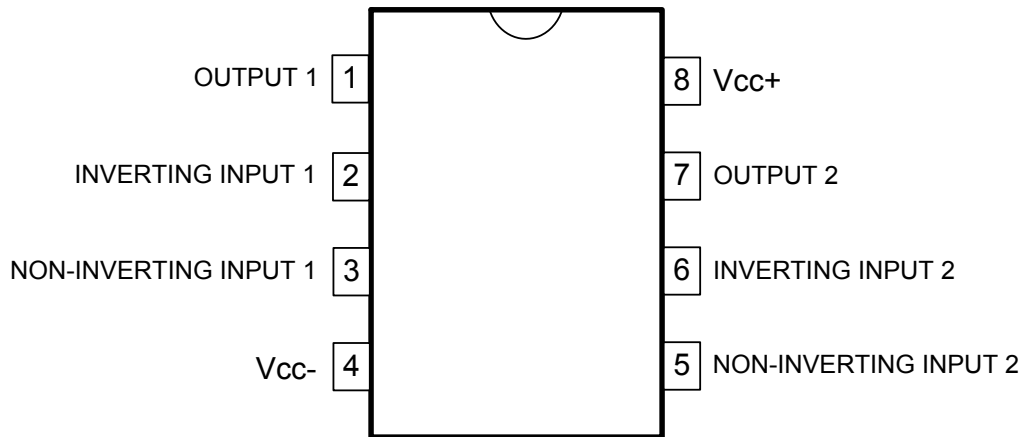
<p>TL072G-D08-T</p> <p>(1)Packing Type</p> <p>(2)Package Type</p> <p>(3)Green Package</p>	<p>(1) T: Tube, R: Tape Reel</p> <p>(2) D08: DIP-8, S08: SOP-8, P08: TSSOP-8</p> <p>(3) G: Halogen Free and Lead Free, L: Lead Free</p>
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MARKING

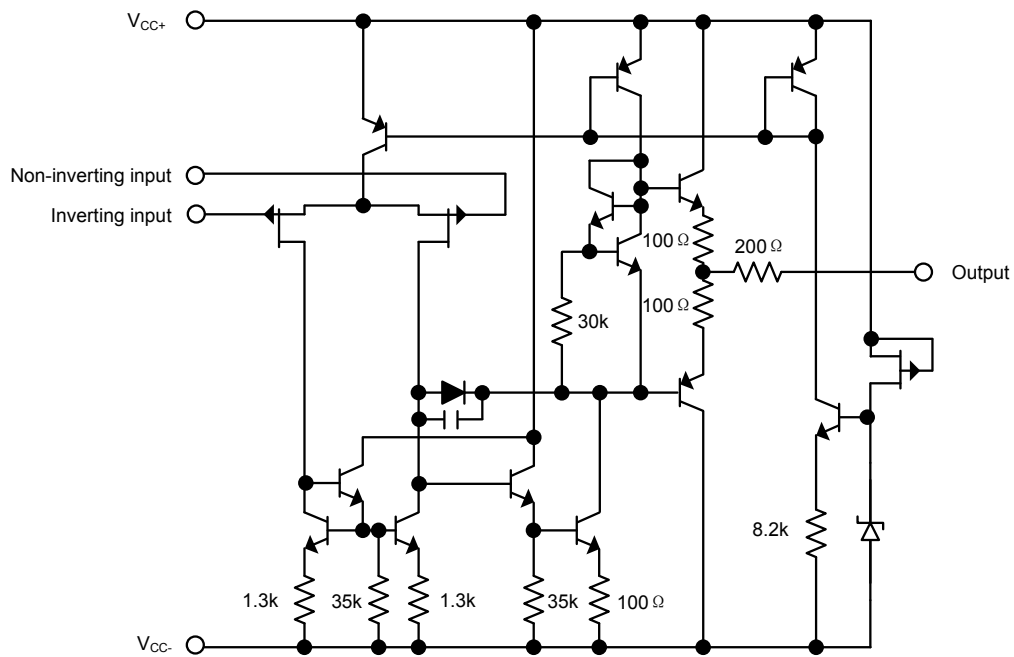
DIP-8	SOP-8	TSSOP-8



■ PIN CONFIGURATION



■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATINGS ($T_A=25^\circ\text{C}$, unless otherwise specified)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage (Note 2)	V_{CC}	± 18	V
Input Voltage (Note 3)	V_{IN}	± 15	V
Differential Input Voltage (Note 4)	$V_{I(DIFF)}$	± 30	V
Power Dissipation	P_D	680	mW
Output Short-Circuit Duration (Note 5)		Infinite	
Operating Temperature	T_{OPR}	-40 ~ +125 (Note 6)	$^\circ\text{C}$
Storage Temperature	T_{STG}	-65 ~ +150	$^\circ\text{C}$

- 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 voltage, are with respect to the zero reference level (ground) of the supply voltages where the zero reference level is the midpoint between V_{CC-} and V_{CC+} .
3. The magnitude of the input voltage must never exceed the magnitude of the supply voltage or 15 volts, whichever is less.
4. Differential voltages are at the non-inverting input terminal with respect to the inverting input terminal.
5. The output may be shorted to ground or to either supply. Temperature and/or supply voltages must be limited to ensure that the dissipation rating is not exceeded.
6. It is guarantee by design, not 100% be tested.

■ ELECTRICAL CHARACTERISTICS ($V_{CC}=\pm 15\text{V}$, $T_A=25^\circ\text{C}$, unless otherwise specified)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT	
Input Offset Voltage	$V_{I(OFF)}$	$R_S=50\Omega$	$T_A=25^\circ\text{C}$		3	10	mV
			$T_{MIN} \leq T_A \leq T_{MAX}$			13	mV
Temperature Coefficient of Input Offset Voltage	$\Delta V_{I(OFF)}$	$R_S=50\Omega$		10		$\mu\text{V}/^\circ\text{C}$	
Input Offset Current (Note)	$I_{I(OFF)}$		$T_A=25^\circ\text{C}$		5	100	pA
			$T_{MIN} \leq T_A \leq T_{MAX}$			10	nA
Input Bias Current (Note)	$I_{I(BIAS)}$		$T_A=25^\circ\text{C}$		20	200	pA
			$T_{MIN} \leq T_A \leq T_{MAX}$			20	nA
Input Common Mode Voltage	$V_{I(CM)}$		± 11	-12~+15		V	
Output Voltage Swing	$V_{O(SW)}$	$R_L=2k\Omega$	$T_A=25^\circ\text{C}$	10	12		V
			$T_{MIN} \leq T_A \leq T_{MAX}$	12	13.5		V
		$R_L=10k\Omega$	$T_A=25^\circ\text{C}$	10			V
			$T_{MIN} \leq T_A \leq T_{MAX}$	12			V
Large Signal Voltage Gain	A _{vd}	$R_L=10k\Omega$, $V_{OUT}=\pm 10\text{V}$	$T_A=25^\circ\text{C}$	25	200		V/mV
			$T_{MIN} \leq T_A \leq T_{MAX}$	15			V/mV
Gain Bandwidth Product	GB _W	$T_A=25^\circ\text{C}$, $R_L=10k\Omega$, $C_L=100\text{pF}$	2.5	4		MHz	
Input Resistance	R_{IN}			10^{12}		Ω	
Common Mode Rejection Ratio	CMR	$R_S=50\Omega$	$T_A=25^\circ\text{C}$	70	86		dB
			$T_{MIN} \leq T_A \leq T_{MAX}$	70			dB
Supply Voltage Rejection Ratio	SVR	$R_S=50\Omega$	$T_A=25^\circ\text{C}$	70	86		dB
			$T_{MIN} \leq T_A \leq T_{MAX}$	70			dB
Supply Current	I_{CC}	No load	$T_A=25^\circ\text{C}$		1.4	2.5	mA
			$T_{MIN} \leq T_A \leq T_{MAX}$			2.5	mA
Channel Separation	V01/V02	$G_V=100$		120		dB	
Output Short-circuit Current	I_{OS}		$T_A=25^\circ\text{C}$	10	40	60	mA
			$T_{MIN} \leq T_A \leq T_{MAX}$	10		60	mA
Slew Rate	SR	$V_{IN}=10\text{V}$, $R_L=2k\Omega$, $C_L=100\text{pF}$, unity gain	8	16		V/ μs	
Rise Time	t_r	$V_{IN}=20\text{mV}$, $R_L=2k\Omega$, $C_L=100\text{pF}$, unity gain		0.1		μs	

■ ELECTRICAL CHARACTERISTICS (Cont.)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Overshoot Factor	Kov	$V_{IN}=20\text{mV}, R_L=2\text{k}\Omega, C_L=100\text{pF}$, unity gain		10		%
Total Harmonic Distortion	THD	$G_V=20\text{dB}, f=1\text{kHz}, R_L=2\text{k}\Omega$, $C_L=100\text{pF}, V_{OUT}=2\text{Vpp}$		0.01		%
Phase Margin	ϕ_m			45		Degrees
Equivalent Input Noise Voltage	eN	$R_S=100\Omega, f=1\text{KHz}$		15		$\frac{\text{nV}}{\sqrt{\text{Hz}}}$

Note: The Input bias currents are junction leakage currents, which approximately double for every 10 °C increase in the junction temperature.

■ PARAMETER MEASUREMENT INFORMATION

Figure 1. Voltage Follower

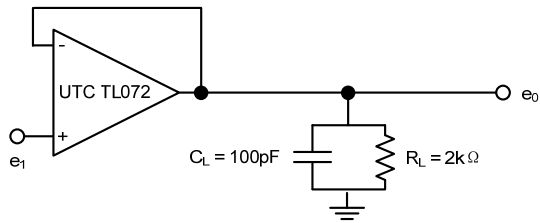
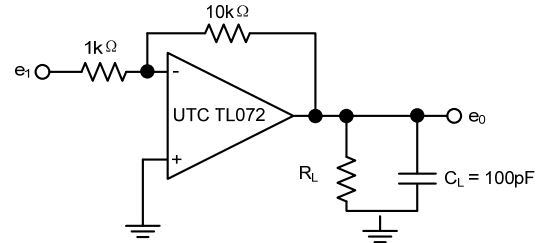
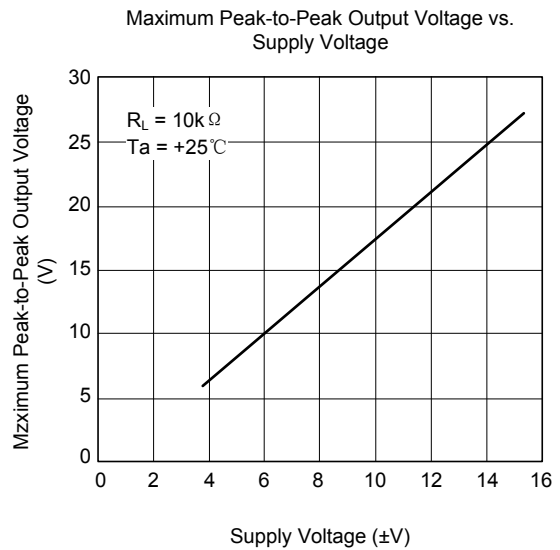
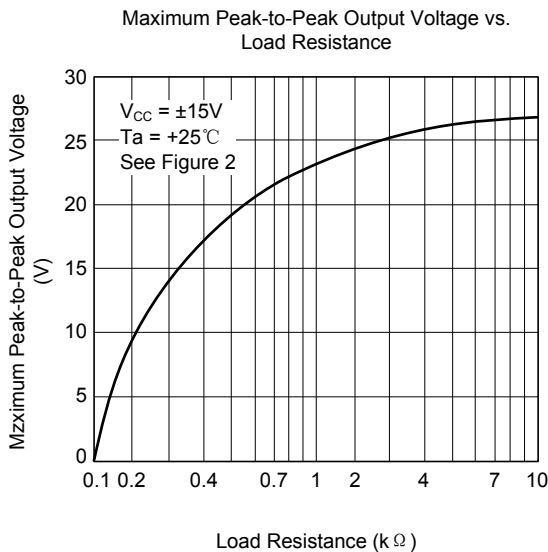
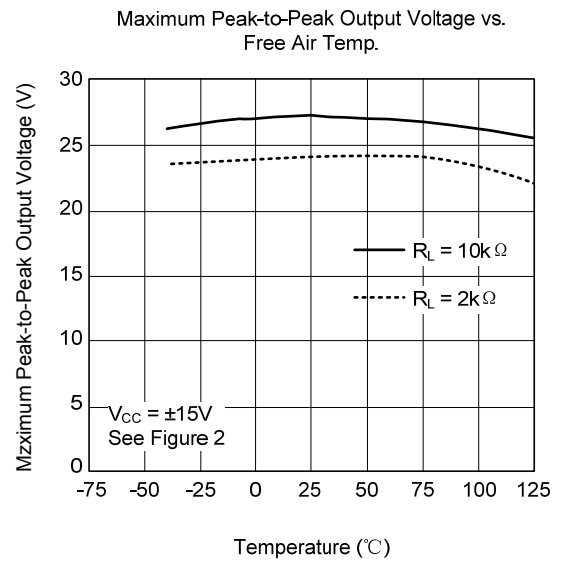
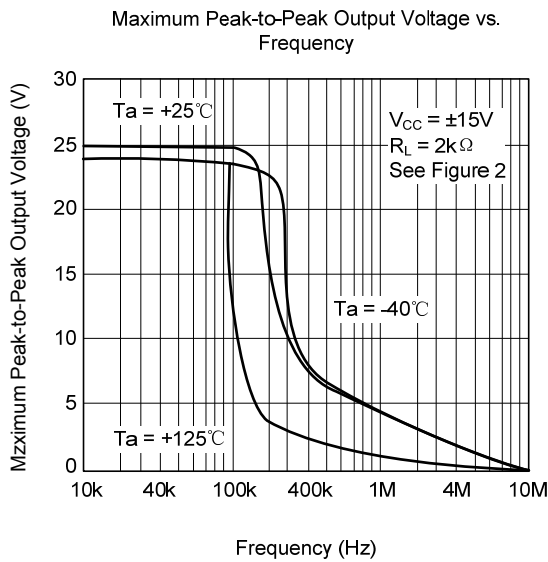
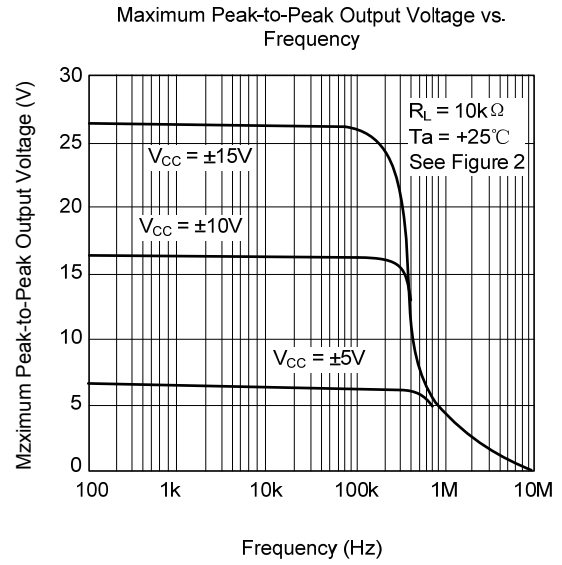
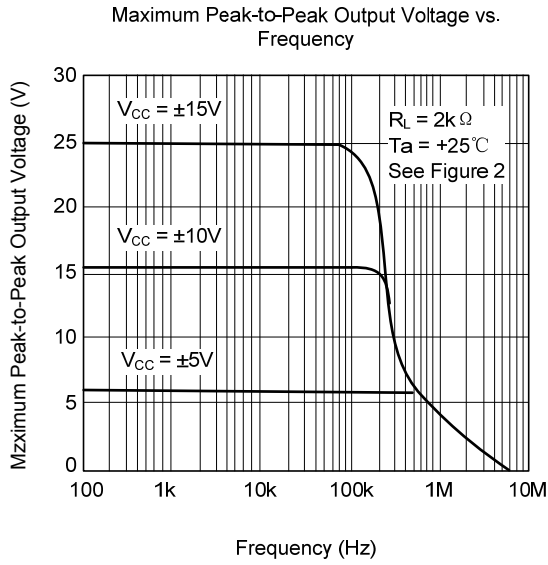


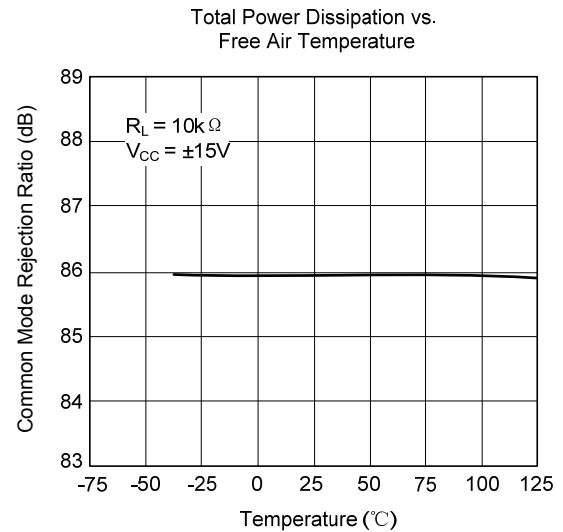
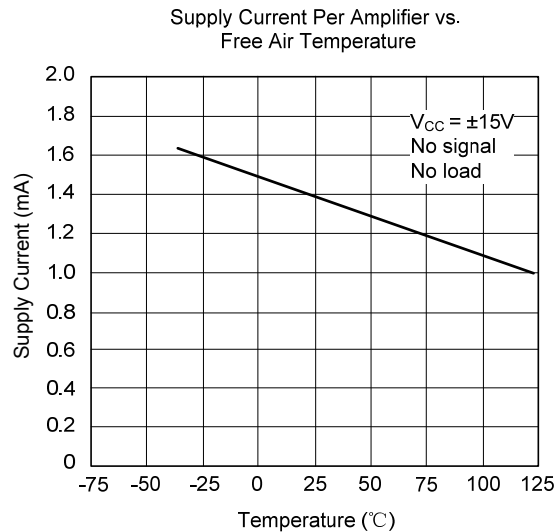
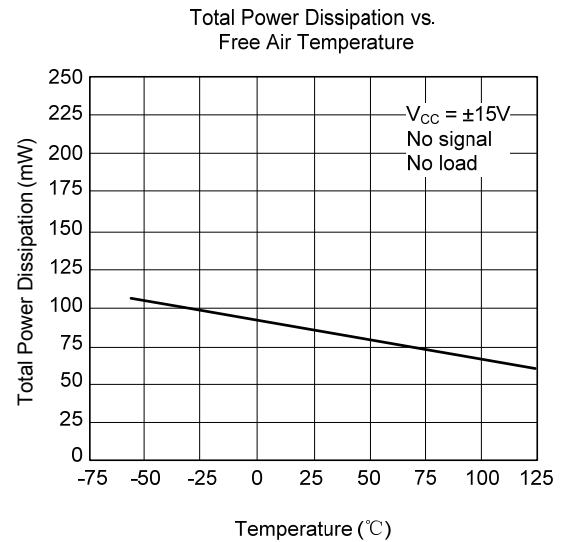
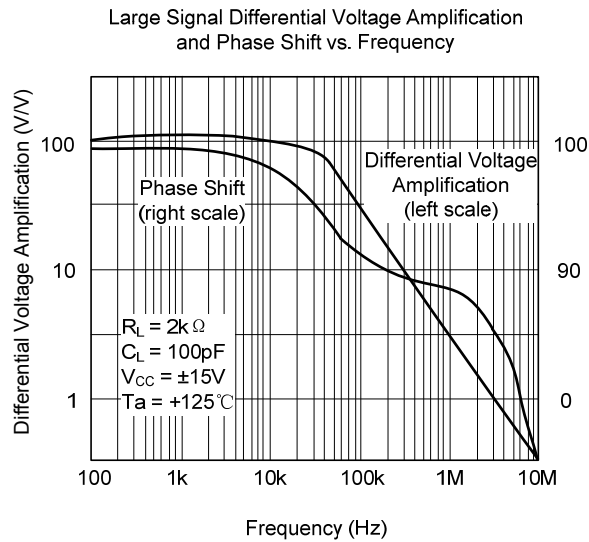
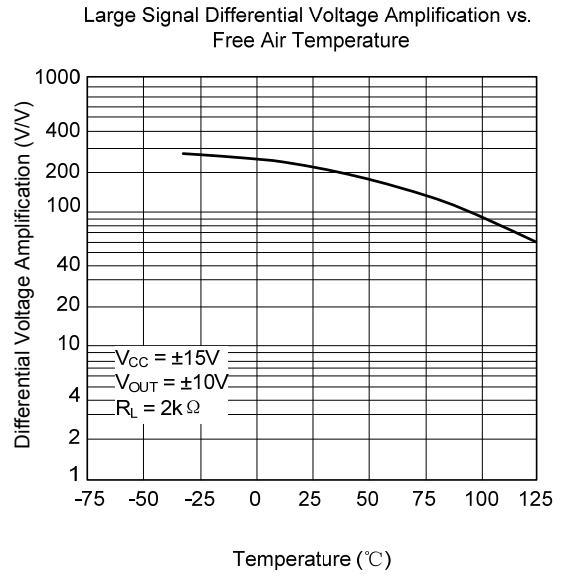
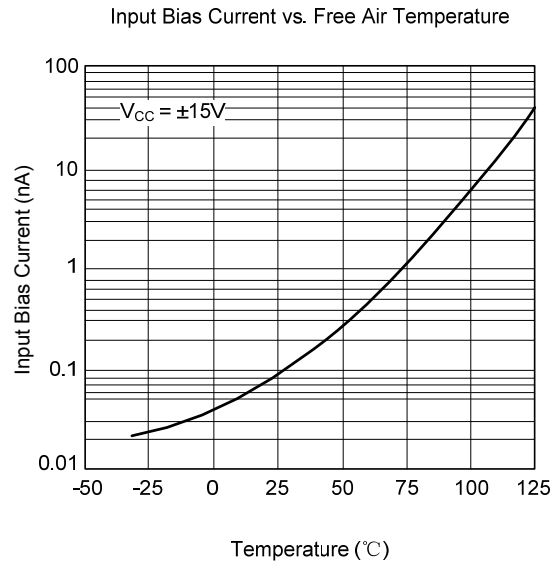
Figure 2. Gain-of-10 Inverting Amplifier



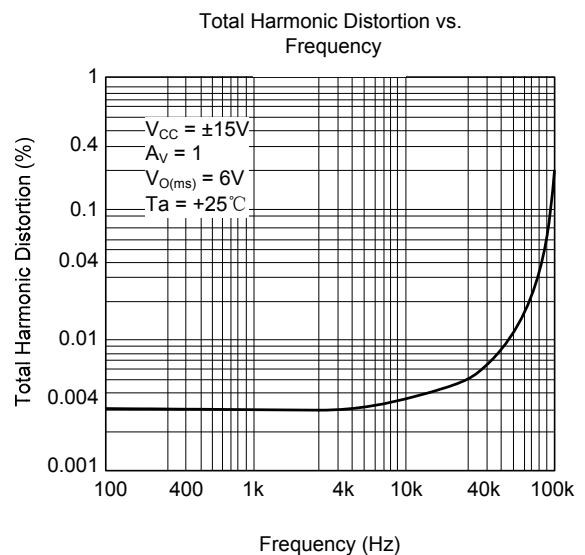
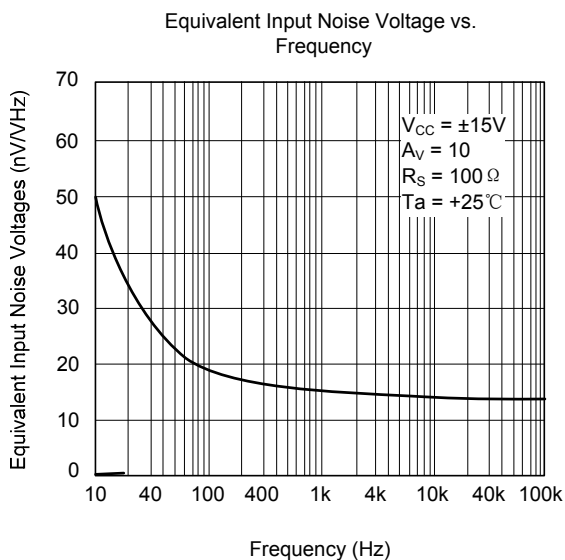
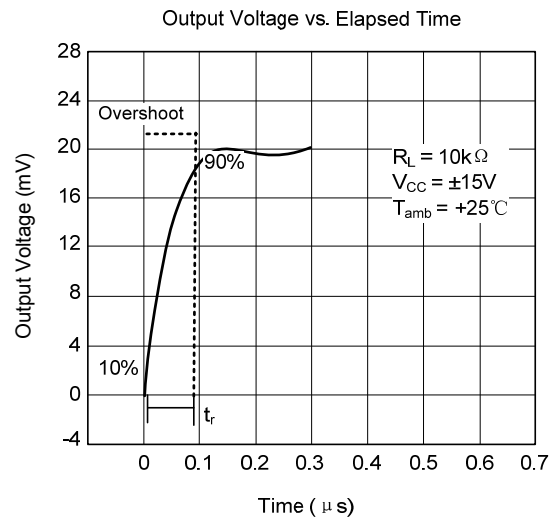
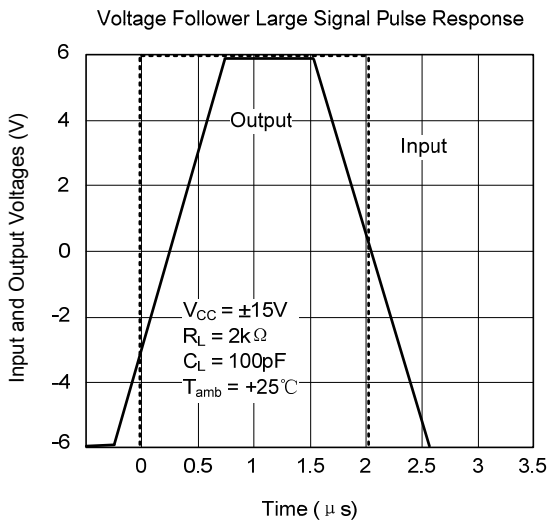
■ TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS (Cont.)



TYPICAL CHARACTERISTICS (Cont.)



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