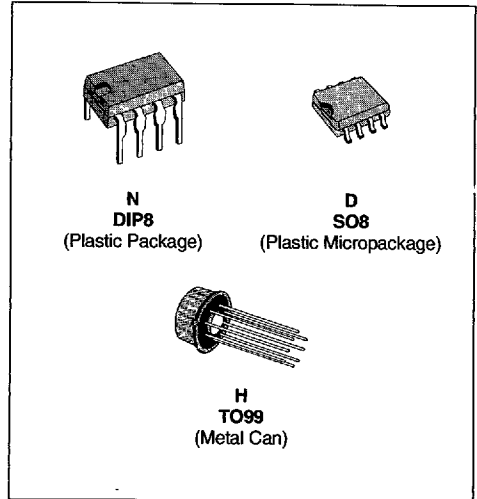


WIDE BANDWIDTH SINGLE J-FET OPERATIONAL AMPLIFIERS

- LOW POWER CONSUMPTION
- WIDE COMMON-MODE (UP TO V_{CC}^+) AND DIFFERENTIAL VOLTAGE RANGE
- LOW INPUT BIAS AND OFFSET CURRENT
- OUTPUT SHORT-CIRCUIT PROTECTION
- HIGH INPUT IMPEDANCE J-FET INPUT STAGE
- INTERNAL FREQUENCY COMPENSATION
- LATCH UP FREE OPERATION
- HIGH SLEW RATE : $16V/\mu s$ (typ)



DESCRIPTION

These circuits are high speed J-FET input single operational amplifiers incorporating well matched, high voltage J-FET and bipolar transistors in a monolithic integrated circuit.

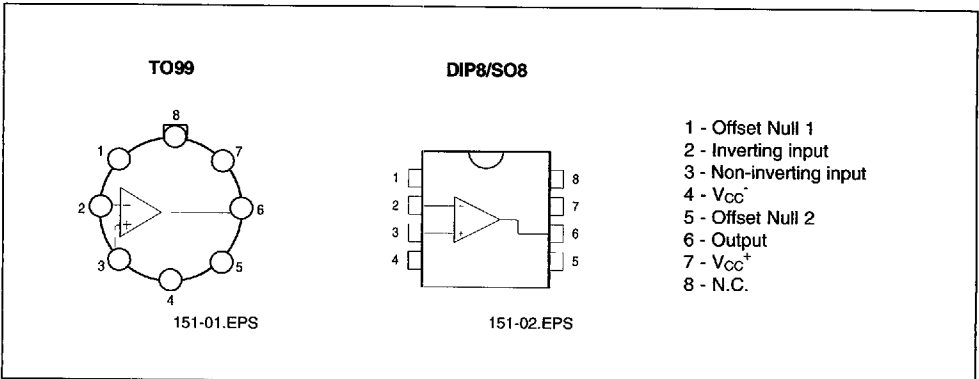
The devices feature high slew rates, low input bias and offset currents, and low offset voltage temperature coefficient.

ORDER CODES

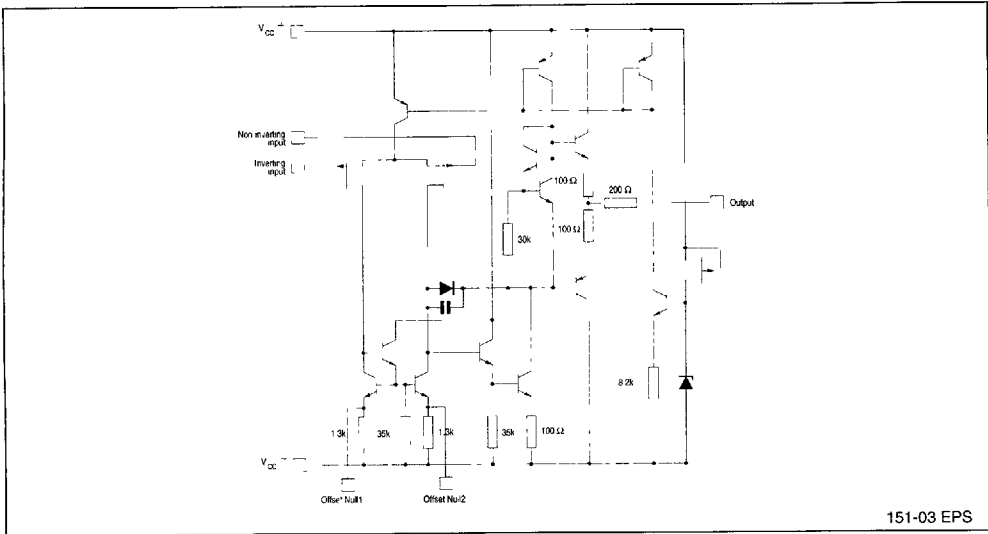
Part Number	Temperature	Package		
		H	N	D
LF351	0°C, +70°C	•	•	•
LF251	-40°C, +105°C	•	•	•
LF151	-55°C, +125°C	•	•	•

151-01.TBL

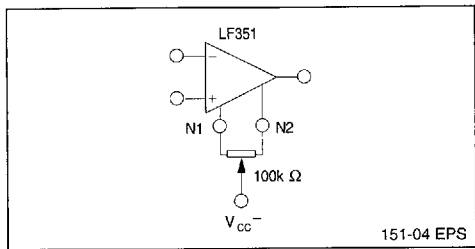
PIN CONNECTIONS (top views)



SCHEMATIC DIAGRAM



INPUT OFFSET VOLTAGE NULL CIRCUITS



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V _{CC}	Supply Voltage - (note 1)	±18	V
V _I	Input Voltage - (note 3)	±15	V
V _{id}	Differential Input Voltage - (note 2)	±30	V
P _{tot}	Power Dissipation	680	mW
	Output Short-circuit Duration - (note 4)	Infinite	
T _{oper}	Operating Free Air Temperature Range	LF351 LF251 LF151	°C
T _{stg}	Storage Temperature Range	-65 to 150	°C

- Notes :
- 1 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}⁻.
 - 2 Differential voltages are at the non-inverting input terminal with respect to the inverting input terminal.
 - 3 The magnitude of the input voltage must never exceed the magnitude of the supply voltage or 15 volts, whichever is less.
 4. 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

ELECTRICAL CHARACTERISTICS

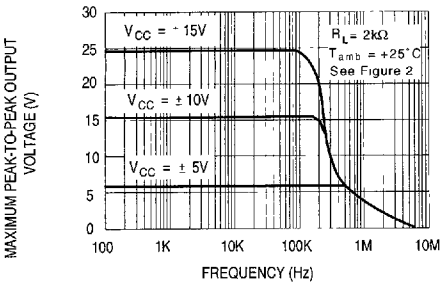
$V_{CC} = \pm 15V$, $T_{amb} = 25^{\circ}C$ (unless otherwise specified)

Symbol	Parameter	LF151 - LF251 - LF351			Unit
		Min.	Typ.	Max.	
V_{io}	Input Offset Voltage ($R_S = 10k\Omega$) $T_{amb} = 25^{\circ}C$ $T_{min} \leq T_{amb} \leq T_{max}$		3	10 13	mV
DV_{io}	Input Offset Voltage Drift		10		$\mu V/^{\circ}C$
I_{io}	Input Offset Current * $T_{amb} = 25^{\circ}C$ $T_{min} \leq T_{amb} \leq T_{max}$		5	100 4	pA nA
I_{ib}	Input Bias Current * $T_{amb} = 25^{\circ}C$ $T_{min} \leq T_{amb} \leq T_{max}$		20	200 20	pA nA
A_{vd}	Large Signal Voltage Gain ($R_L = 2k\Omega$, $V_O = \pm 10V$) $T_{amb} = 25^{\circ}C$ $T_{min} \leq T_{amb} \leq T_{max}$	50 25	200		V/mV
SVR	Supply Voltage Rejection Ratio ($R_S = 10k\Omega$) $T_{amb} = 25^{\circ}C$ $T_{min} \leq T_{amb} \leq T_{max}$	80 80	86		dB
I_{CC}	Supply Current (no load) $T_{amb} = 25^{\circ}C$ $T_{min} \leq T_{amb} \leq T_{max}$		1.4	3.4 3.4	mA
V_{icm}	Input Common Mode Voltage Range	± 11	+15 -12		V
CMR	Common Mode Rejection Ratio ($R_S = 10k\Omega$) $T_{amb} = 25^{\circ}C$ $T_{min} \leq T_{amb} \leq T_{max}$	70 70	86		dB
I_{OS}	Output Short-circuit Current $T_{amb} = 25^{\circ}C$ $T_{min} \leq T_{amb} \leq T_{max}$	10 10	40	60 60	mA
$\pm V_{OPP}$	Output Voltage Swing $T_{amb} = 25^{\circ}C$ $T_{min} \leq T_{amb} \leq T_{max}$ $R_L = 2k\Omega$ $R_L = 10k\Omega$ $R_L = 2k\Omega$ $R_L = 10k\Omega$	10 12 10 12	12 13.5		V
SR	Slew Rate ($V_i = 10V$, $R_L = 2k\Omega$, $C_L = 100pF$, $T_{amb} = 25^{\circ}C$, unity gain)	12	16		V/ μs
t_r	Rise Time ($V_i = 20mV$, $R_L = 2k\Omega$, $C_L = 100pF$, $T_{amb} = 25^{\circ}C$, unity gain)		0.1		μs
K_{OV}	Overshoot ($V_i = 20mV$, $R_L = 2k\Omega$, $C_L = 100pF$, $T_{amb} = 25^{\circ}C$, unity gain)		10		%
GBP	Gain Bandwidth Product ($f = 100kHz$, $T_{amb} = 25^{\circ}C$, $V_{in} = 10mV$, $R_L = 2k\Omega$, $C_L = 100pF$)	2.5	4		MHz
R_i	Input Resistance		10^{12}		Ω
THD	Total Harmonic Distortion ($f = 1kHz$, $A_v = 20dB$, $R_L = 2k\Omega$, $C_L = 100pF$, $T_{amb} = 25^{\circ}C$, $V_O = 2V_{PP}$)		0.01		%
e_n	Equivalent Input Noise Voltage ($f = 1kHz$, $R_S = 100\Omega$)		15		$\frac{nV}{\sqrt{Hz}}$
ϕ_m	Phase Margin		45		Degrees

* The input bias currents are junction leakage currents which approximately double for every $10^{\circ}C$ increase in the junction temperature.

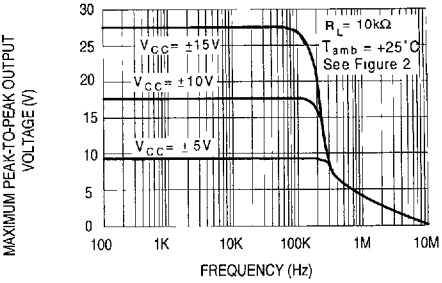
151-03.TBL

MAXIMUM PEAK-TO-PEAK OUTPUT
VOLTAGE VERSUS FREQUENCY



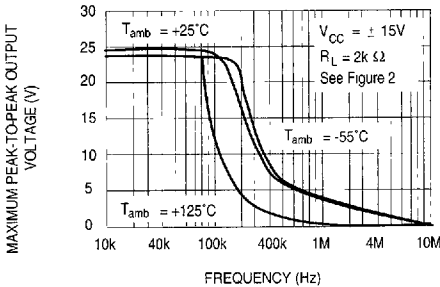
151-05.EPS

MAXIMUM PEAK-TO-PEAK OUTPUT
VOLTAGE VERSUS FREQUENCY



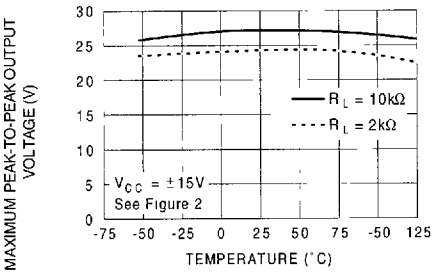
151-06.EPS

MAXIMUM PEAK-TO-PEAK OUTPUT
VOLTAGE VERSUS FREQUENCY



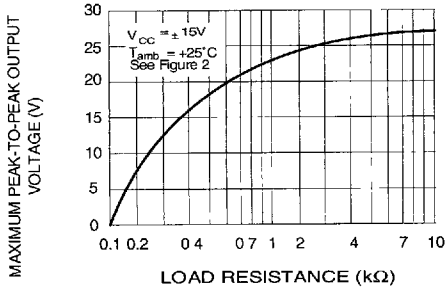
151-07.EPS

MAXIMUM PEAK-TO-PEAK OUTPUT
VOLTAGE VERSUS FREE AIR TEMP.



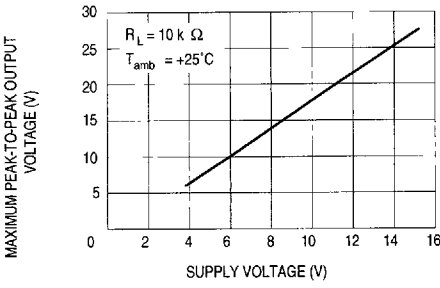
151-08.EPS

MAXIMUM PEAK-TO-PEAK OUTPUT
VOLTAGE VERSUS LOAD RESISTANCE



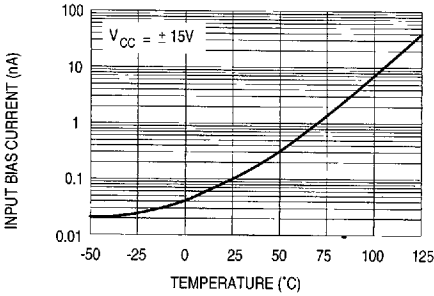
151-09.EPS

MAXIMUM PEAK-TO-PEAK OUTPUT
VOLTAGE VERSUS SUPPLY VOLTAGE



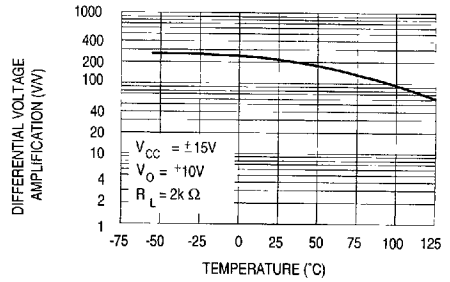
151-10.EPS

INPUT BIAS CURRENT VERSUS FREE AIR TEMPERATURE



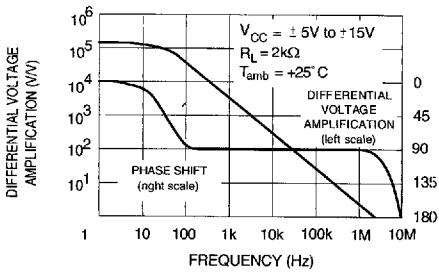
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LARGE SIGNAL DIFFERENTIAL VOLTAGE AMPLIFICATION VERSUS FREE AIR TEMPERATURE



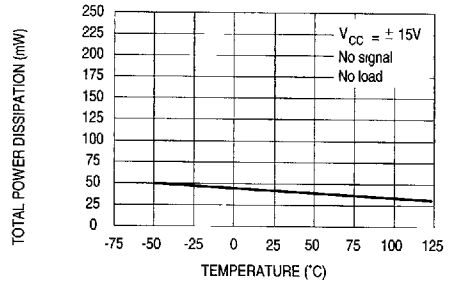
151-12 EPS

LARGE SIGNAL DIFFERENTIAL VOLTAGE AMPLIFICATION AND PHASE SHIFT VERSUS FREQUENCY



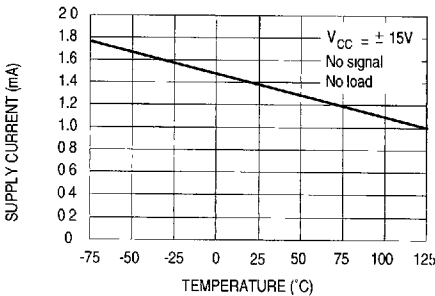
151-13 EPS

TOTAL POWER DISSIPATION VERSUS FREE AIR TEMPERATURE



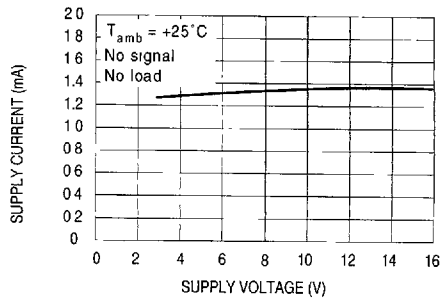
151-14.EPS

SUPPLY CURRENT PER AMPLIFIER VERSUS FREE AIR TEMPERATURE



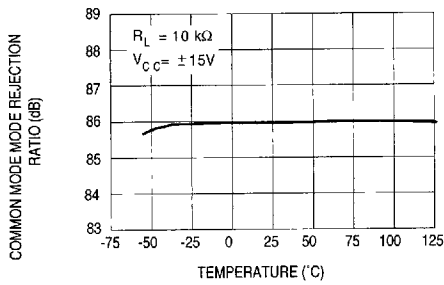
151-15 EPS

SUPPLY CURRENT PER AMPLIFIER VERSUS SUPPLY VOLTAGE



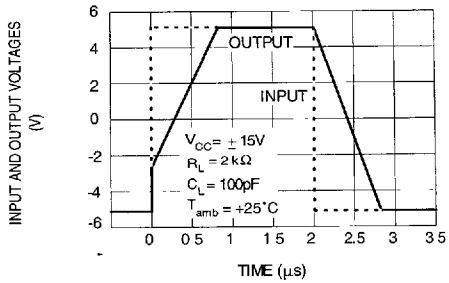
151-16 EPS

COMMON MODE REJECTION RATIO
VERSUS FREE AIR TEMPERATURE



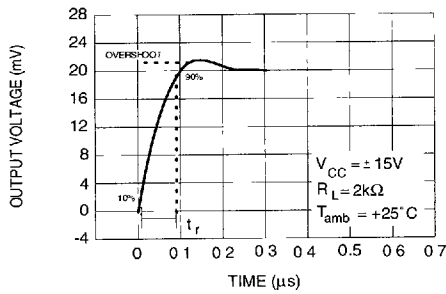
151-17 EPS

VOLTAGE FOLLOWER LARGE SIGNAL
PULSE RESPONSE



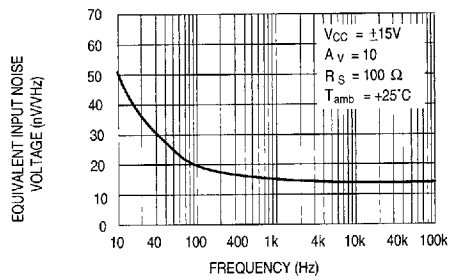
151-18 EPS

OUTPUT VOLTAGE VERSUS
ELAPSED TIME



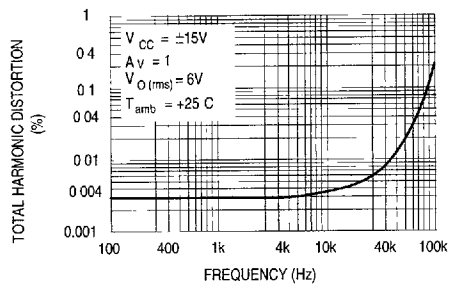
151-19.EPS

EQUIVALENT INPUT NOISE VOLTAGE
VERSUS FREQUENCY



151-20.EPS

TOTAL HARMONIC DISTORTION VERSUS
FREQUENCY



151-21 EPS

PARAMETER MEASUREMENT INFORMATION

Figure 1 : Voltage Follower

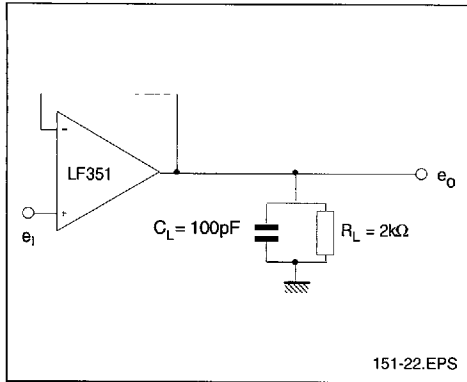
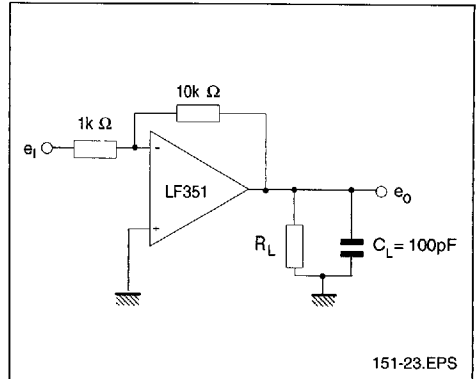
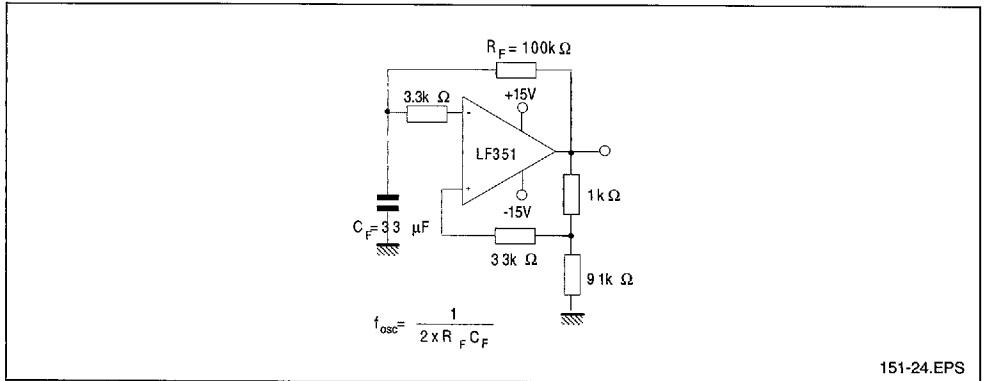


Figure 2 : Gain-of-10 Inverting Amplifier



TYPICAL APPLICATIONS

(0.5Hz) SQUARE WAVE OSCILLATOR



HIGH Q NOTCH FILTER

