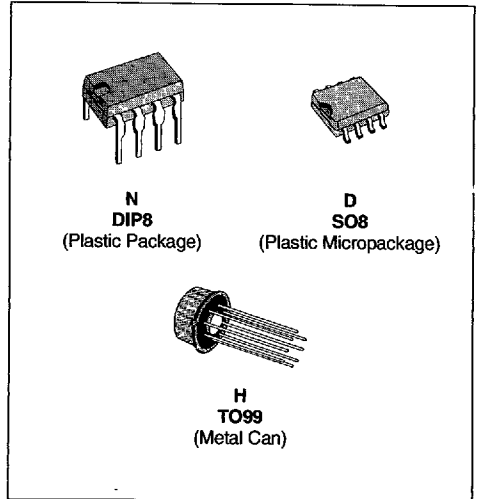


**WIDE BANDWIDTH**  
**SINGLE J-FET OPERATIONAL AMPLIFIERS**

- 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.

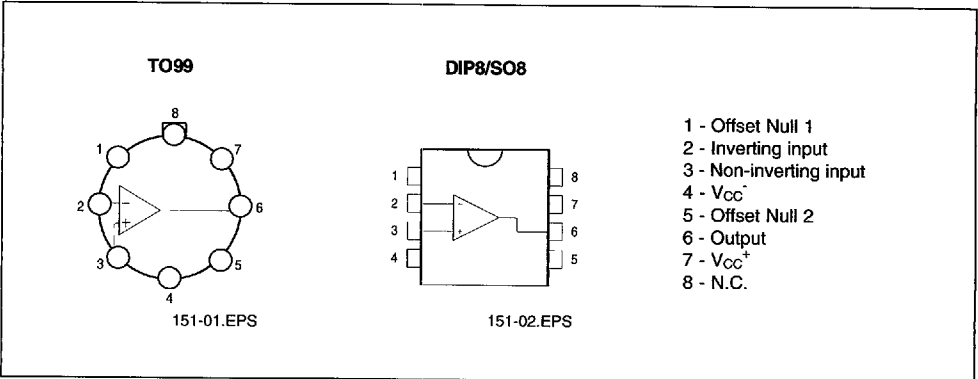
The devices feature high slew rates, low input bias and offset currents, and low offset voltage temperature coefficient.

**ORDER CODES**

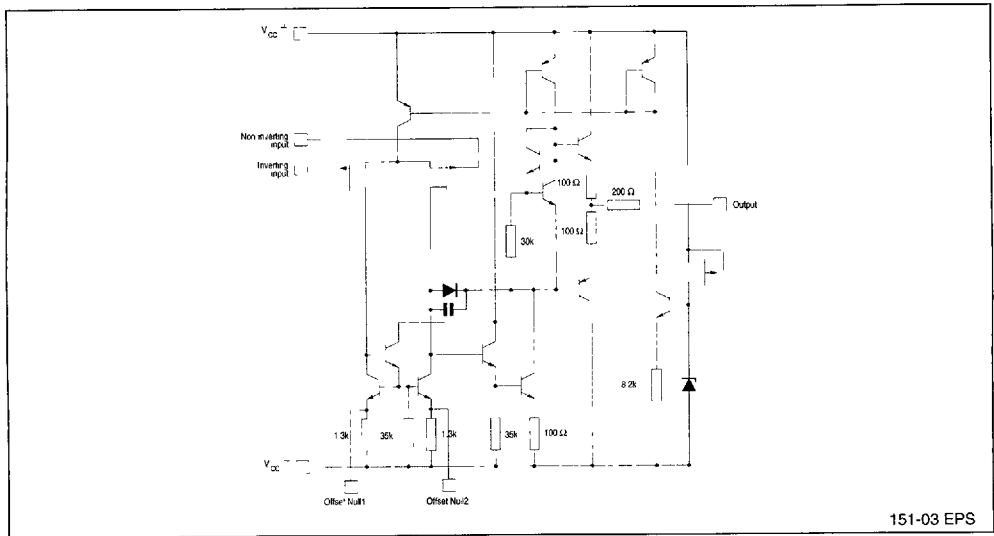
Part Number	Temperature	Package		
		H	N	D
LF351	0°C, +70°C	•	•	•
LF251	-40°C, +105°C	•	•	•
LF151	-55°C, +125°C	•	•	•

151-01.TBL

**PIN CONNECTIONS** (top views)

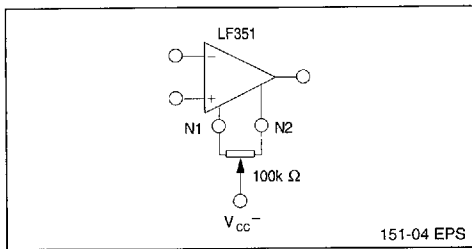


**SCHEMATIC DIAGRAM**



151-03 EPS

**INPUT OFFSET VOLTAGE NULL CIRCUITS**



151-04 EPS

**ABSOLUTE MAXIMUM RATINGS**

Symbol	Parameter	Value	Unit
$V_{CC}$	Supply Voltage - (note 1)	$\pm 18$	V
$V_i$	Input Voltage - (note 3)	$\pm 15$	V
$V_{id}$	Differential Input Voltage - (note 2)	$\pm 30$	V
$P_{tot}$	Power Dissipation	680	mW
	Output Short-circuit Duration - (note 4)	Infinite	
$T_{oper}$	Operating Free Air Temperature Range	LF351 LF251 LF151	$^{\circ}C$
$T_{stg}$	Storage Temperature Range		$^{\circ}C$

- 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**

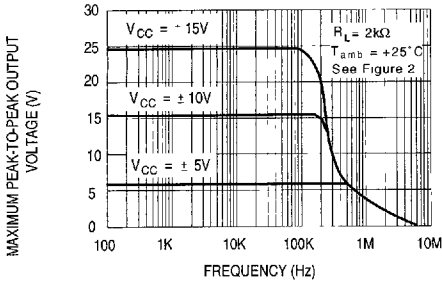
V<sub>CC</sub> = ±15V, T<sub>amb</sub> = 25°C (unless otherwise specified)

Symbol	Parameter	LF151 - LF251 - LF351			Unit
		Min.	Typ.	Max.	
V <sub>io</sub>	Input Offset Voltage (R <sub>S</sub> = 10kΩ) T <sub>amb</sub> = 25°C T <sub>min</sub> ≤ T <sub>amb</sub> ≤ T <sub>max</sub>		3	10 13	mV
DV <sub>io</sub>	Input Offset Voltage Drift		10		μV/°C
I <sub>io</sub>	Input Offset Current * T <sub>amb</sub> = 25°C T <sub>min</sub> ≤ T <sub>amb</sub> ≤ T <sub>max</sub>		5	100 4	pA nA
I <sub>ib</sub>	Input Bias Current * T <sub>amb</sub> = 25°C T <sub>min</sub> ≤ T <sub>amb</sub> ≤ T <sub>max</sub>		20	200 20	pA nA
A <sub>vd</sub>	Large Signal Voltage Gain (R <sub>L</sub> = 2kΩ, V <sub>O</sub> = ±10V) T <sub>amb</sub> = 25°C T <sub>min</sub> ≤ T <sub>amb</sub> ≤ T <sub>max</sub>	50 25	200		V/mV
SVR	Supply Voltage Rejection Ratio (R <sub>S</sub> = 10kΩ) T <sub>amb</sub> = 25°C T <sub>min</sub> ≤ T <sub>amb</sub> ≤ T <sub>max</sub>	80 80	86		dB
I <sub>CC</sub>	Supply Current (no load) T <sub>amb</sub> = 25°C T <sub>min</sub> ≤ T <sub>amb</sub> ≤ T <sub>max</sub>		1.4	3.4 3.4	mA
V <sub>icm</sub>	Input Common Mode Voltage Range	±11	+15 -12		V
CMR	Common Mode Rejection Ratio (R <sub>S</sub> = 10kΩ) T <sub>amb</sub> = 25°C T <sub>min</sub> ≤ T <sub>amb</sub> ≤ T <sub>max</sub>	70 70	86		dB
I <sub>OS</sub>	Output Short-circuit Current T <sub>amb</sub> = 25°C T <sub>min</sub> ≤ T <sub>amb</sub> ≤ T <sub>max</sub>	10 10	40	60 60	mA
±V <sub>OPP</sub>	Output Voltage Swing T <sub>amb</sub> = 25°C T <sub>min</sub> ≤ T <sub>amb</sub> ≤ T <sub>max</sub> R <sub>L</sub> = 2kΩ R <sub>L</sub> = 10kΩ R <sub>L</sub> = 2kΩ R <sub>L</sub> = 10kΩ	10 12 10 12	12 13.5		V
SR	Slew Rate (V <sub>i</sub> = 10V, R <sub>L</sub> = 2kΩ, C <sub>L</sub> = 100pF, T <sub>amb</sub> = 25°C, unity gain)	12	16		V/μs
t <sub>r</sub>	Rise Time (V <sub>i</sub> = 20mV, R <sub>L</sub> = 2kΩ, C <sub>L</sub> = 100pF, T <sub>amb</sub> = 25°C, unity gain)		0.1		μs
K <sub>OV</sub>	Overshoot (V <sub>i</sub> = 20mV, R <sub>L</sub> = 2kΩ, C <sub>L</sub> = 100pF, T <sub>amb</sub> = 25°C, unity gain)		10		%
GBP	Gain Bandwidth Product (f = 100kHz, T <sub>amb</sub> = 25°C, V <sub>in</sub> = 10mV, R <sub>L</sub> = 2kΩ, C <sub>L</sub> = 100pF)	2.5	4		MHz
R <sub>i</sub>	Input Resistance		10 <sup>12</sup>		Ω
THD	Total Harmonic Distortion (f = 1kHz, A <sub>v</sub> = 20dB, R <sub>L</sub> = 2kΩ, C <sub>L</sub> = 100pF, T <sub>amb</sub> = 25°C, V <sub>O</sub> = 2V <sub>PP</sub> )		0.01		%
e <sub>n</sub>	Equivalent Input Noise Voltage (f = 1kHz, R <sub>S</sub> = 100Ω)		15		nV √Hz
∅ <sub>m</sub>	Phase Margin		45		Degrees

\* The input bias currents are junction leakage currents which approximately double for every 10°C increase in the junction temperature.

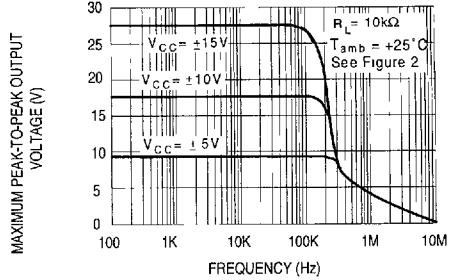
151-03.TBL

**MAXIMUM PEAK-TO-PEAK OUTPUT VOLTAGE VERSUS FREQUENCY**



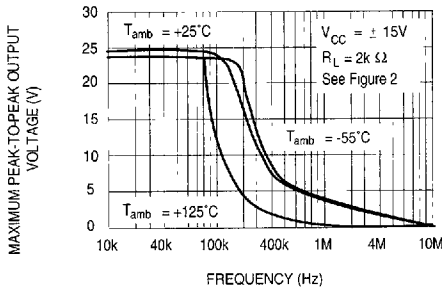
151-05.EPS

**MAXIMUM PEAK-TO-PEAK OUTPUT VOLTAGE VERSUS FREQUENCY**



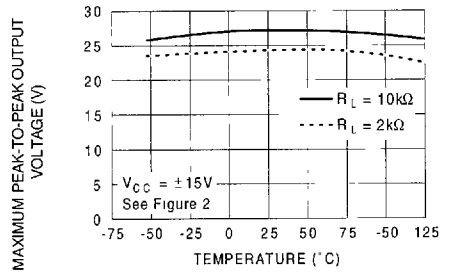
151-06.EPS

**MAXIMUM PEAK-TO-PEAK OUTPUT VOLTAGE VERSUS FREQUENCY**



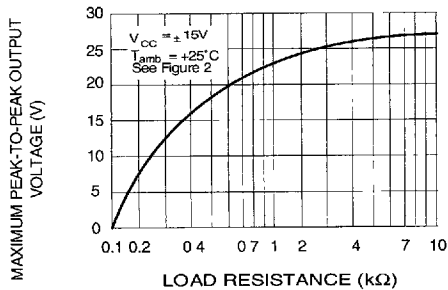
151-07.EPS

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



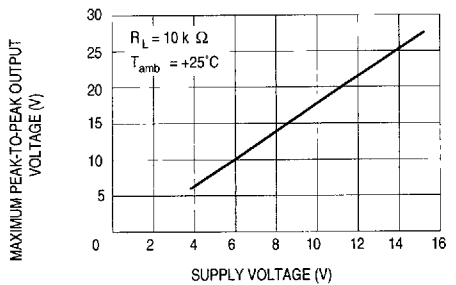
151-08.EPS

**MAXIMUM PEAK-TO-PEAK OUTPUT VOLTAGE VERSUS LOAD RESISTANCE**



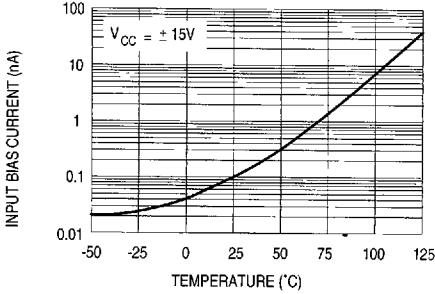
151-09.EPS

**MAXIMUM PEAK-TO-PEAK OUTPUT VOLTAGE VERSUS SUPPLY VOLTAGE**



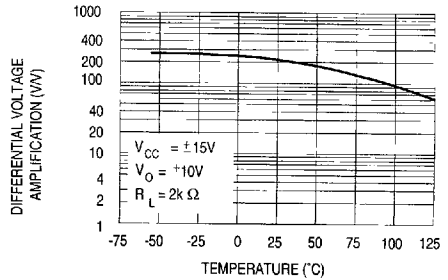
151-10.EPS

**INPUT BIAS CURRENT VERSUS FREE AIR TEMPERATURE**



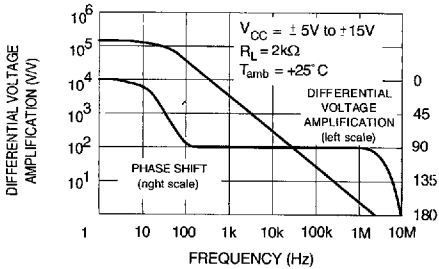
151-11.EPS

**LARGE SIGNAL DIFFERENTIAL VOLTAGE AMPLIFICATION VERSUS FREE AIR TEMPERATURE**



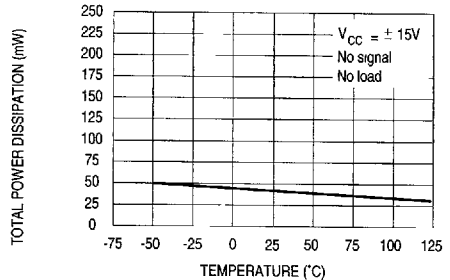
151-12 EPS

**LARGE SIGNAL DIFFERENTIAL VOLTAGE AMPLIFICATION AND PHASE SHIFT VERSUS FREQUENCY**



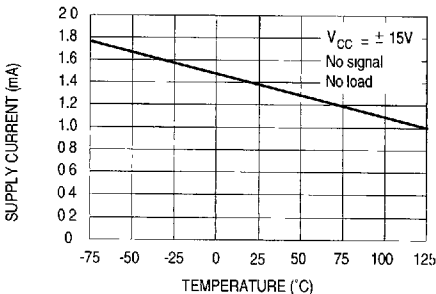
151-13 EPS

**TOTAL POWER DISSIPATION VERSUS FREE AIR TEMPERATURE**



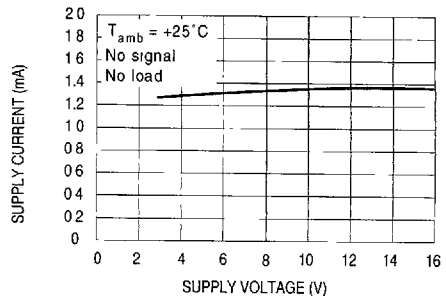
151-14.EPS

**SUPPLY CURRENT PER AMPLIFIER VERSUS FREE AIR TEMPERATURE**



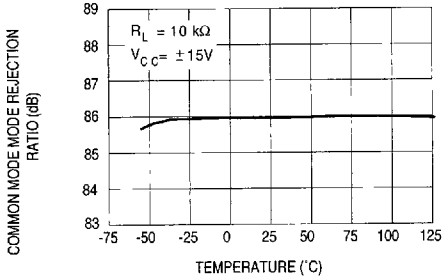
151-15 EPS

**SUPPLY CURRENT PER AMPLIFIER VERSUS SUPPLY VOLTAGE**



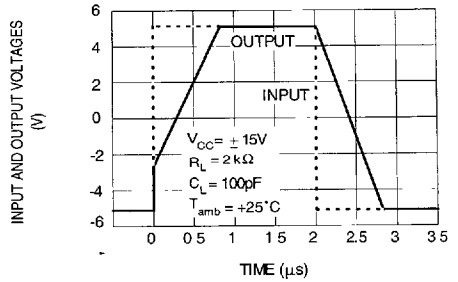
151-16 EPS

**COMMON MODE REJECTION RATIO  
VERSUS FREE AIR TEMPERATURE**



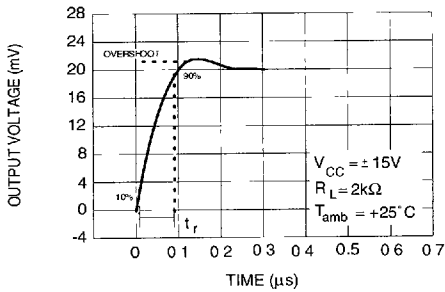
151-17 EPS

**VOLTAGE FOLLOWER LARGE SIGNAL  
PULSE RESPONSE**



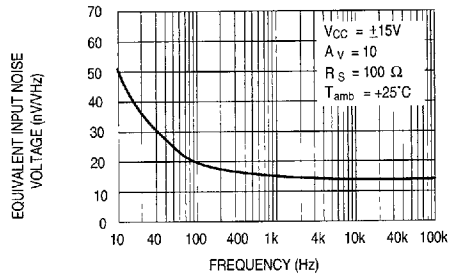
151-18 EPS

**OUTPUT VOLTAGE VERSUS  
ELAPSED TIME**



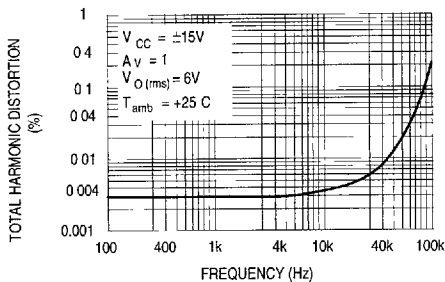
151-19.EPS

**EQUIVALENT INPUT NOISE VOLTAGE  
VERSUS FREQUENCY**



151-20.EPS

**TOTAL HARMONIC DISTORTION VERSUS  
FREQUENCY**



151-21 EPS

PARAMETER MEASUREMENT INFORMATION

Figure 1 : Voltage Follower

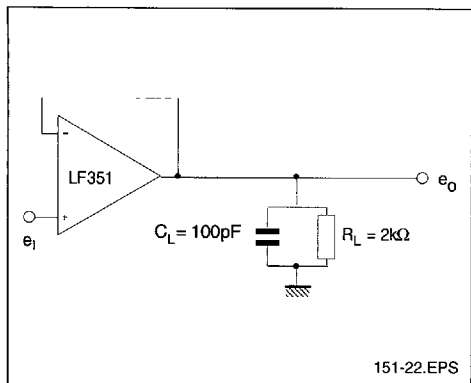
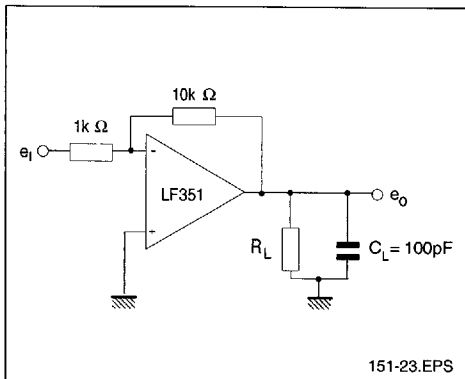
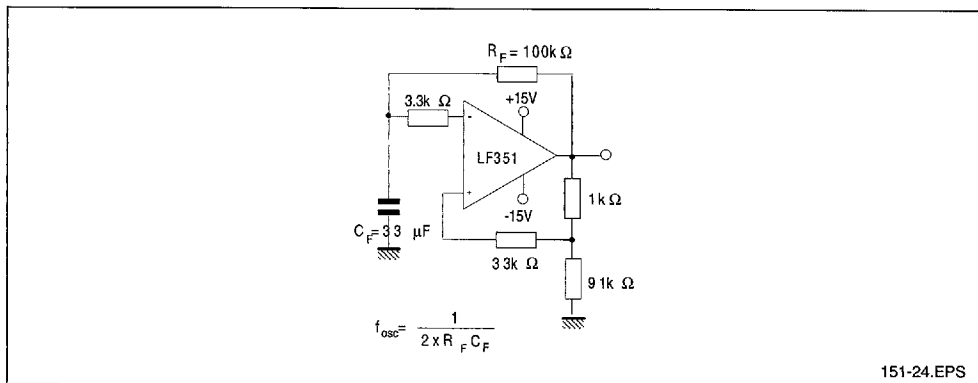


Figure 2 : Gain-of-10 Inverting Amplifier



TYPICAL APPLICATIONS

(0.5Hz) SQUARE WAVE OSCILLATOR



HIGH Q NOTCH FILTER

