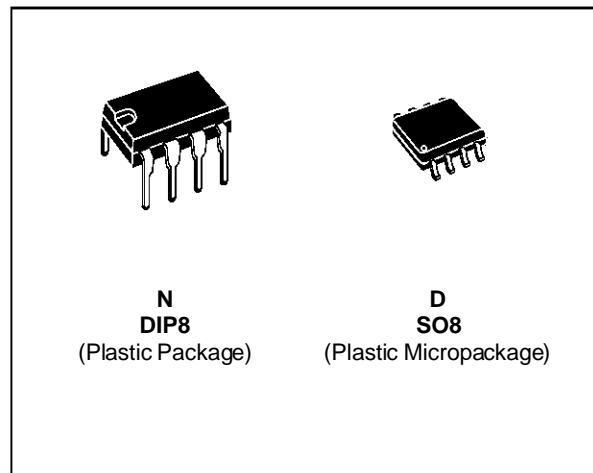


WIDE BANDWIDTH SINGLE J-FET OPERATIONAL AMPLIFIER

- INTERNALLY ADJUSTABLE INPUT OFFSET VOLTAGE
- 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

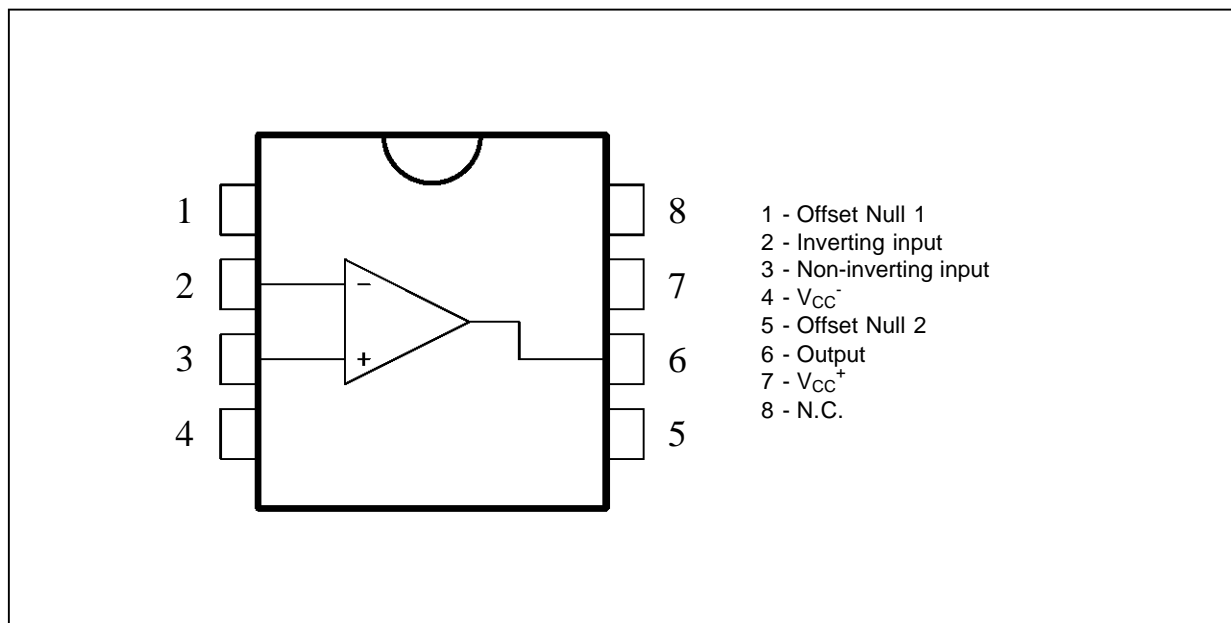
These circuits are high speed J-FET input single operational amplifiers incorporating well matched, high voltage J-FET and bipolar transistors in a monolithic integrated circuit.

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

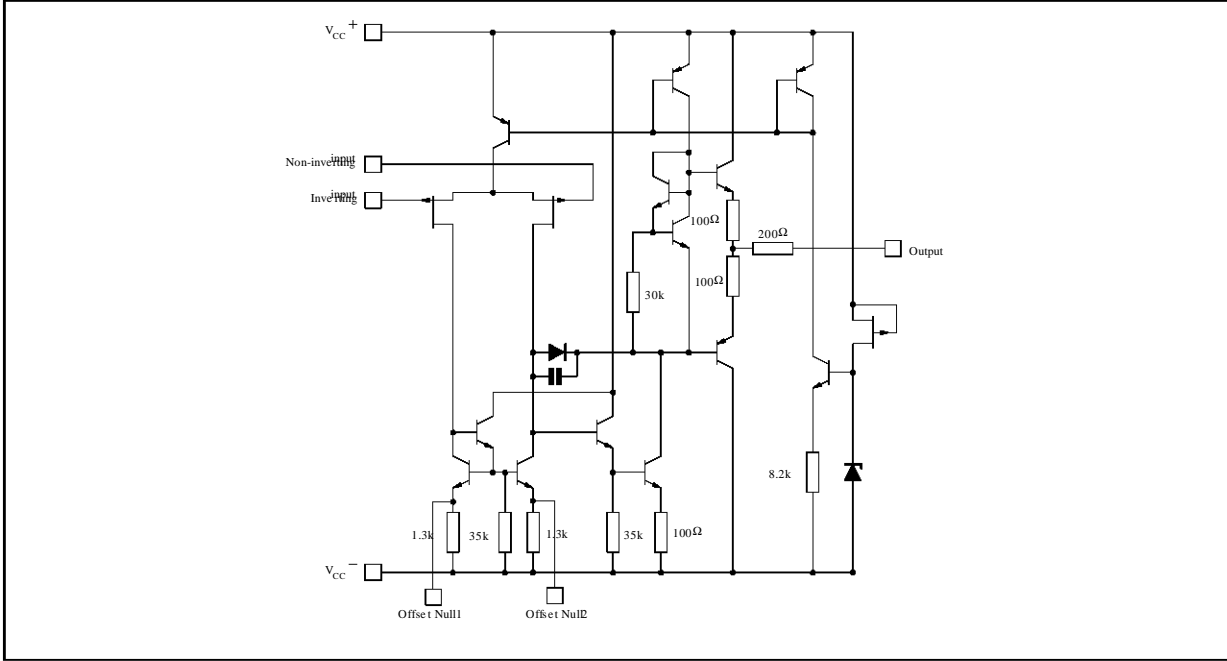
ORDER CODES

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

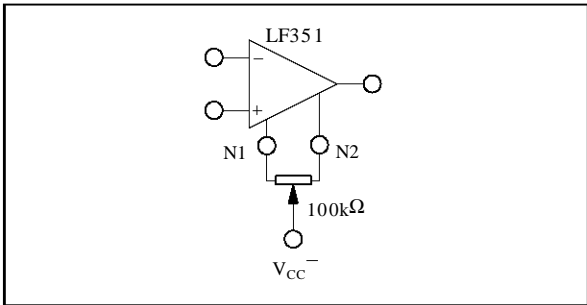
PIN CONNECTIONS (top view)



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	$^{\circ}\text{C}$
T_{stg}	Storage Temperature Range		$^{\circ}\text{C}$

- 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.

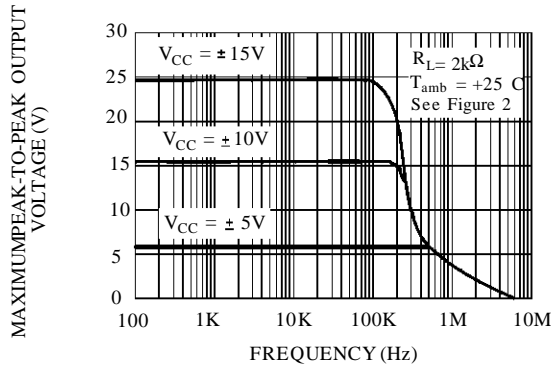
ELECTRICAL CHARACTERISTICS

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

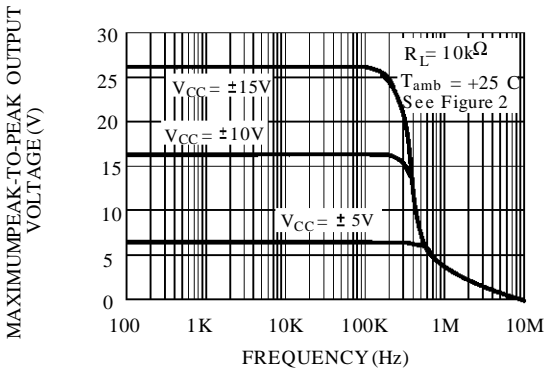
Symbol	Parameter	LF151 - LF251 - LF351			Unit
		Min.	Typ.	Max.	
V_{io}	Input Offset Voltage ($R_S = 10k\Omega$) $T_{amb} = 25^{\circ}C$ $T_{min.} \leq T_{amb} \leq T_{max.}$		3	10 13	mV
DV_{io}	Input Offset Voltage Drift		10		$\mu V/^{\circ}C$
I_{io}	Input Offset Current * $T_{amb} = 25^{\circ}C$ $T_{min.} \leq T_{amb} \leq T_{max.}$		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.

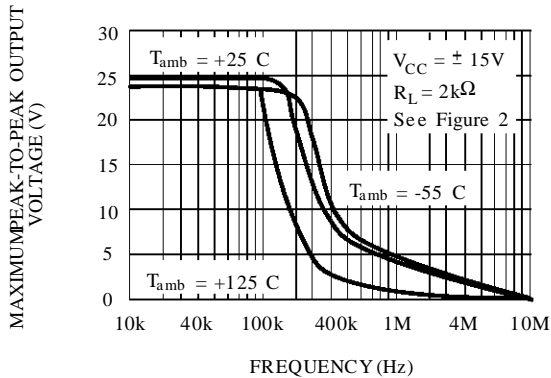
MAXIMUM PEAK-TO-PEAK OUTPUT
VOLTAGE VERSUS FREQUENCY



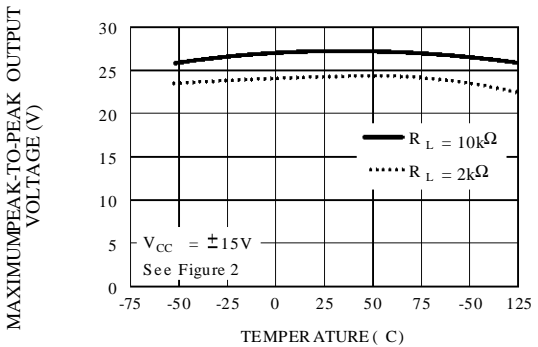
MAXIMUM PEAK-TO-PEAK OUTPUT
VOLTAGE VERSUS FREQUENCY



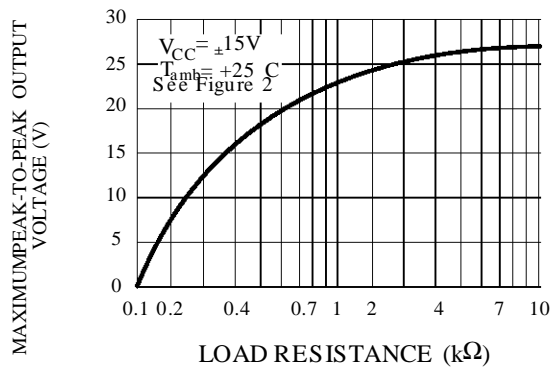
MAXIMUM PEAK-TO-PEAK OUTPUT
VOLTAGE VERSUS FREQUENCY



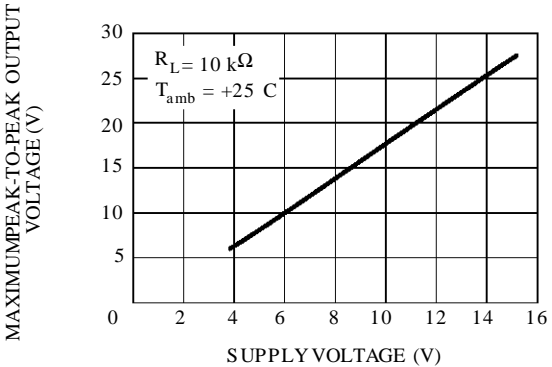
MAXIMUM PEAK-TO-PEAK OUTPUT
VOLTAGE VERSUS FREE AIR TEMP.



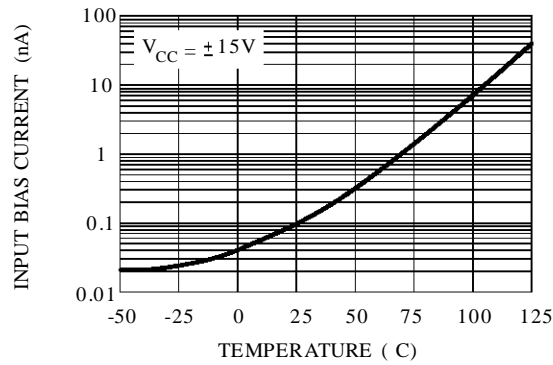
MAXIMUM PEAK-TO-PEAK OUTPUT
VOLTAGE VERSUS LOAD RESISTANCE



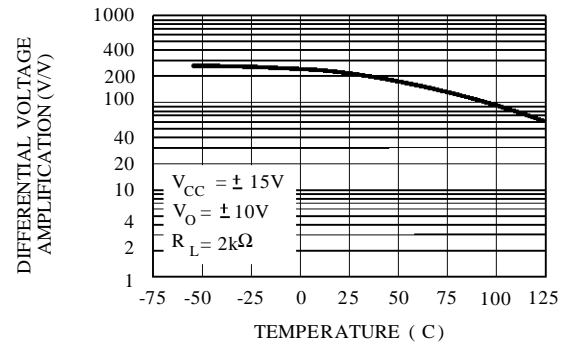
MAXIMUM PEAK-TO-PEAK OUTPUT
VOLTAGE VERSUS SUPPLY VOLTAGE



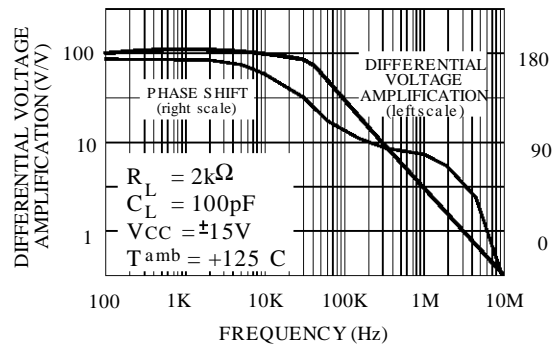
**INPUT BIAS CURRENT VERSUS
FREE AIR TEMPERATURE**



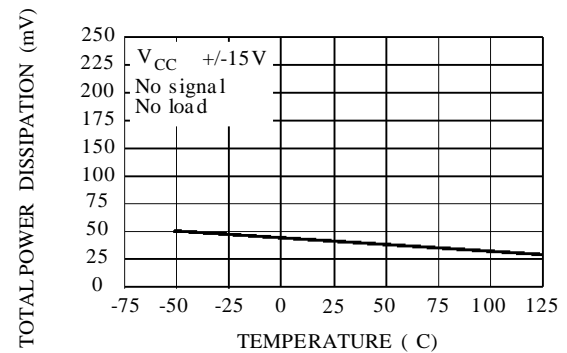
**LARGE SIGNAL DIFFERENTIAL
VOLTAGE AMPLIFICATION VERSUS
FREE AIR TEMPERATURE**



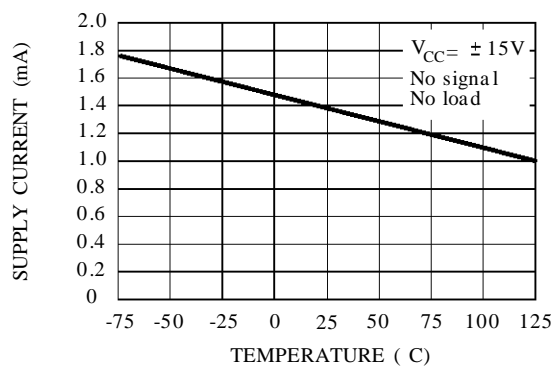
**LARGE SIGNAL DIFFERENTIAL
VOLTAGE AMPLIFICATION AND PHASE
SHIFT VERSUS FREQUENCY**



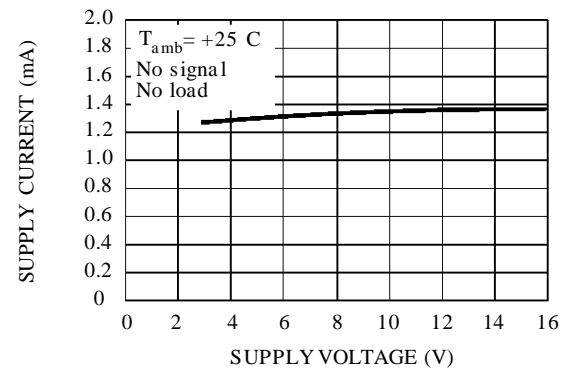
**TOTAL POWER DISSIPATION VERSUS
FREE AIR TEMPERATURE**



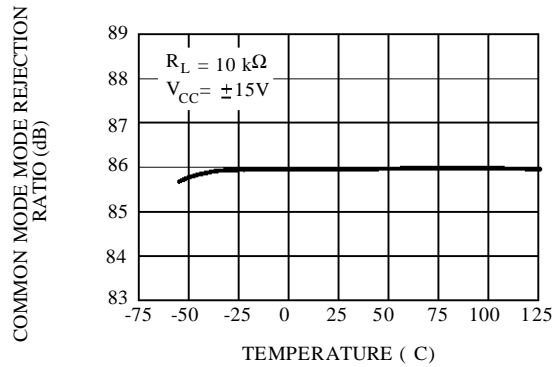
**SUPPLY CURRENT PER AMPLIFIER
VERSUS FREE AIR TEMPERATURE**



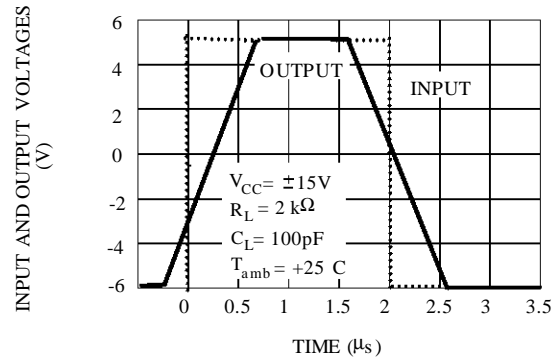
**SUPPLY CURRENT PER AMPLIFIER
VERSUS SUPPLY VOLTAGE**



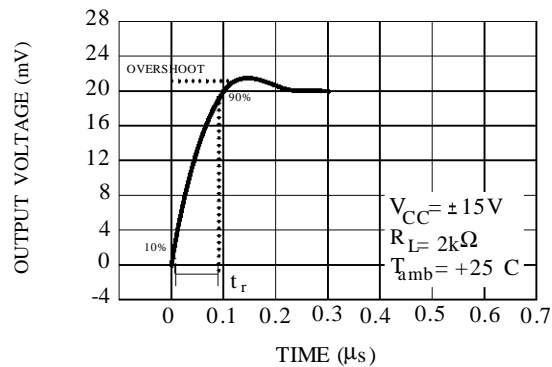
COMMON MODE REJECTION RATIO VERSUS FREE AIR TEMPERATURE



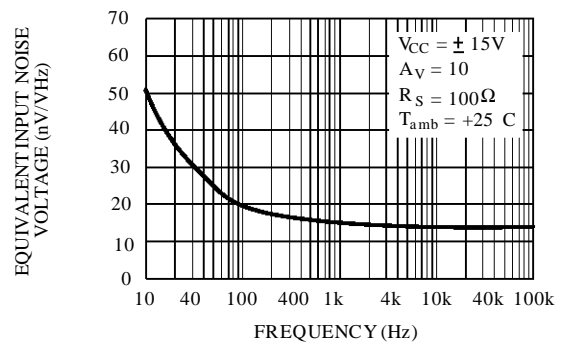
VOLTAGE FOLLOWER LARGE SIGNAL PULSE RESPONSE



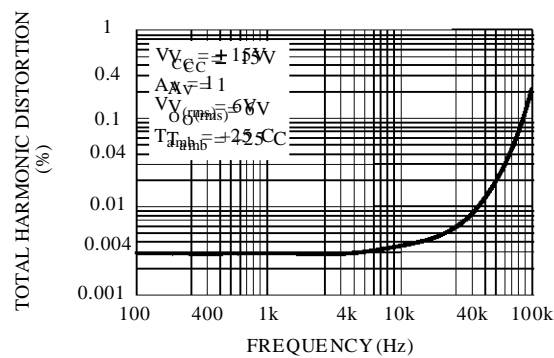
OUTPUT VOLTAGE VERSUS ELAPSED TIME



EQUIVALENT INPUT NOISE VOLTAGE VERSUS FREQUENCY



TOTAL HARMONIC DISTORTION VERSUS FREQUENCY



PARAMETER MEASUREMENT INFORMATION

Figure 1 : Voltage Follower

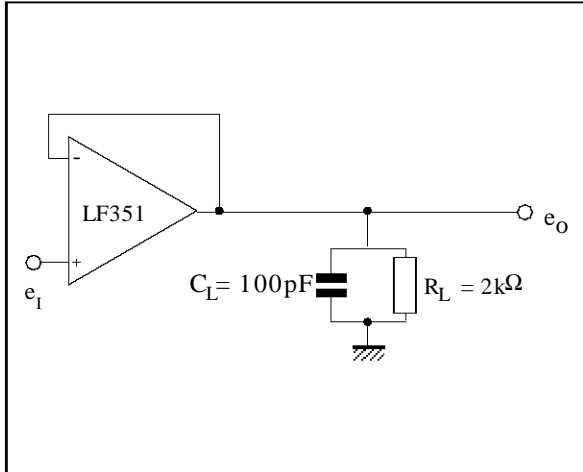
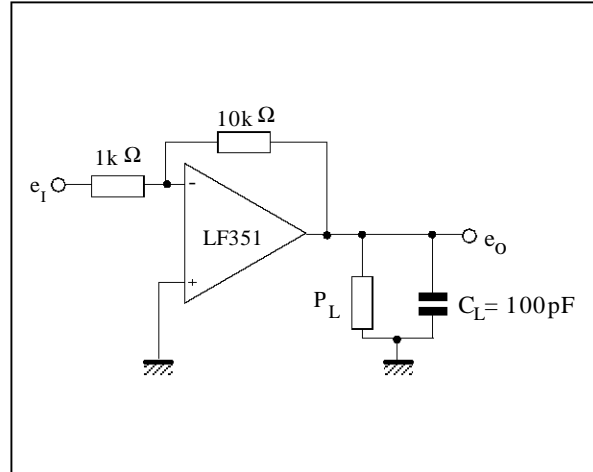
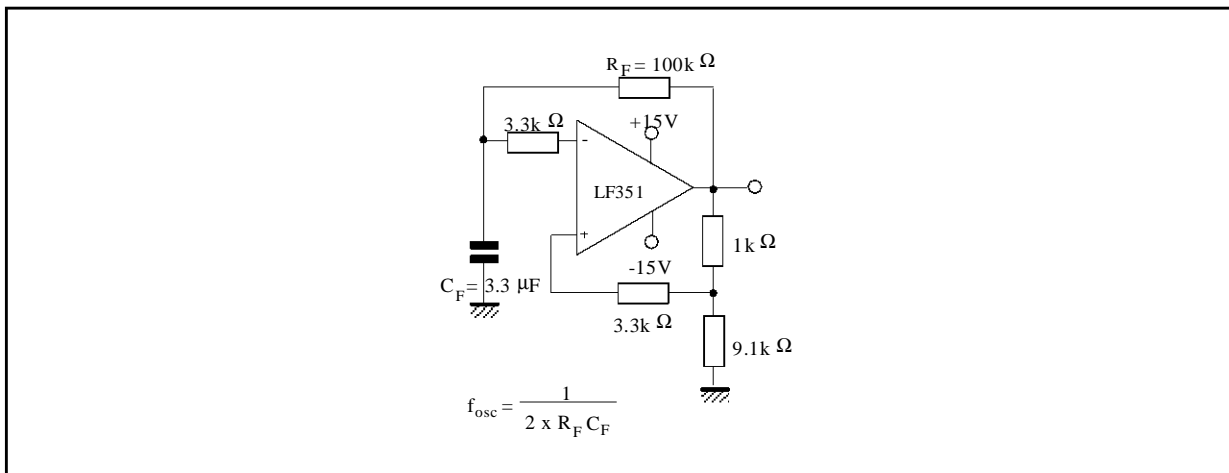


Figure 2 : Gain-of-10 Inverting Amplifier

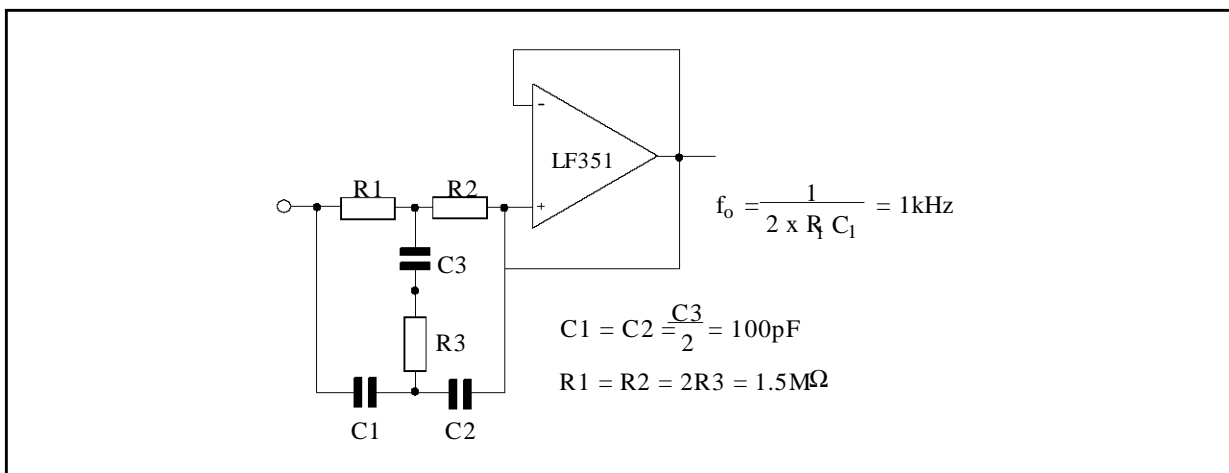


TYPICAL APPLICATION

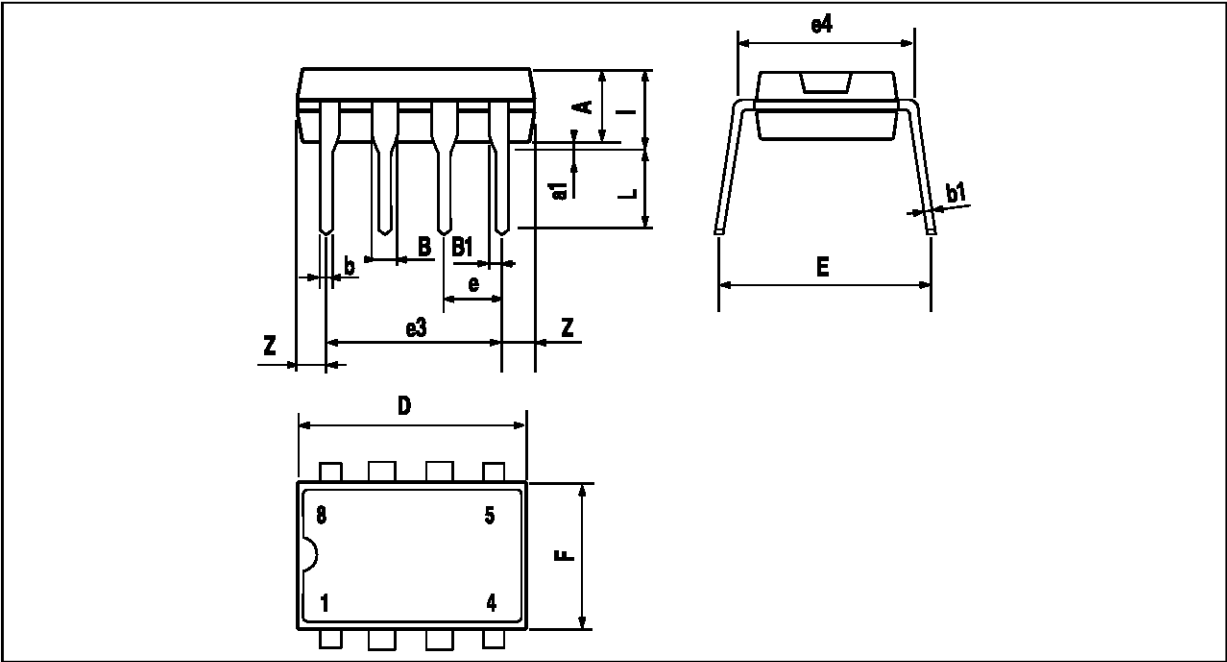
(0.5Hz) SQUARE WAVE OSCILLATOR



HIGH Q NOTCH FILTER



PACKAGE MECHANICAL DATA
8 PINS - PLASTIC DIP

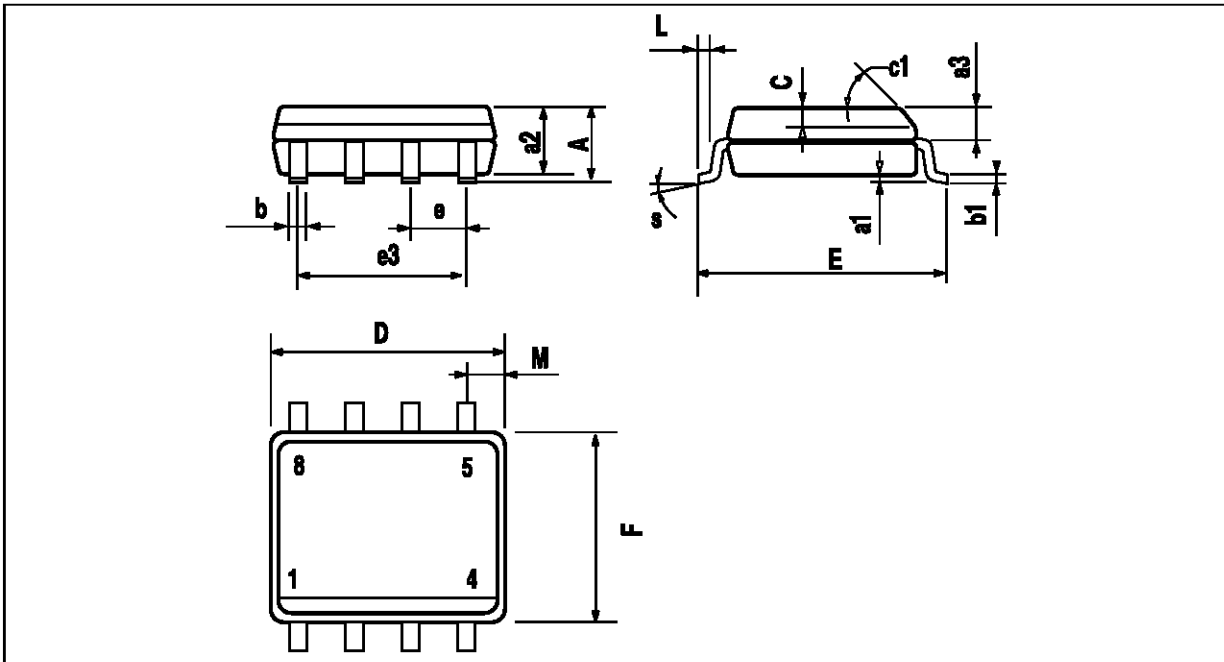


PM-DIP8.EPS

Dimensions	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A		3.32			0.131	
a1	0.51			0.020		
B	1.15		1.65	0.045		0.065
b	0.356		0.55	0.014		0.022
b1	0.204		0.304	0.008		0.012
D			10.92			0.430
E	7.95		9.75	0.313		0.384
e		2.54			0.100	
e3		7.62			0.300	
e4		7.62			0.300	
F			6.6			0.260
i			5.08			0.200
L	3.18		3.81	0.125		0.150
Z			1.52			0.060

DIP8.TBL

PACKAGE MECHANICAL DATA
8 PINS - PLASTIC MICROPACKAGE (SO)



Dimensions	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			1.75			0.069
a1	0.1		0.25	0.004		0.010
a2			1.65			0.065
a3	0.65		0.85	0.026		0.033
b	0.35		0.48	0.014		0.019
b1	0.19		0.25	0.007		0.010
C	0.25		0.5	0.010		0.020
c1	45° (typ.)					
D	4.8		5.0	0.189		0.197
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		3.81			0.150	
F	3.8		4.0	0.150		0.157
L	0.4		1.27	0.016		0.050
M			0.6			0.024
S	8° (max.)					

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