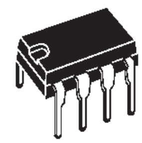
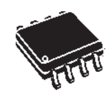
# LF155-LF255-LF355
# LF156-LF256-LF356
# LF157-LF257-LF357

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

- HIGH INPUT IMPEDANCE J-FET INPUT STAGE
- HIGH SPEED J-FET OP-AMPs : up to 20MHz, 50V/µs
- OFFSET VOLTAGE ADJUSTMENT DOES NOT DEGRADE DRIFT OR COMMON-MODE REJECTION AS IN MOST OF MONOLITHIC AMPLIFIERS
- INTERNAL COMPENSATION AND LARGE DIFFERENTIAL INPUT VOLTAGE CAPABILITY (UP TO $V_{CC}^{+}$)



**N**
**DIP8**
(Plastic Package)



**D**
**SO8**
(Plastic Micropackage)

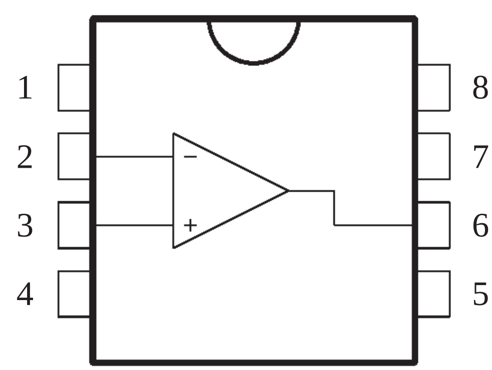
### TYPICAL APPLICATIONS

- PRECISION HIGH SPEED INTEGRATORS
- FAST D/A AND CONVERTERS
- HIGH IMPEDANCE BUFFERS
- WIDEBAND, LOW NOISE, LOW DRIFT AMPLIFIERS
- LOGARITHIMIC AMPLIFIERS
- PHOTOCELL AMPLIFIERS
- SAMPLE AND HOLD CIRCUITS

### ORDER CODES

| Part Number | Temperature Range | Package N | Package D |
|---|---|---|---|
| LF355, LF356, LF357 | 0°C, +70°C | • | • |
| LF255, LF256, LF257 | –40°C, +105°C | • | • |
| LF155, LF156, LF157 | –55°C, +125°C | • | • |
| **Example :** LF355N | | | |

### PIN CONNECTIONS (top view)




1 - Offset Null 1
2 - Inverting input
3 - Non-inverting input
4 - $V_{CC}^{-}$
5 - Offset Null 2
6 - Output
7 - $V_{CC}^{+}$
8 - N.C.

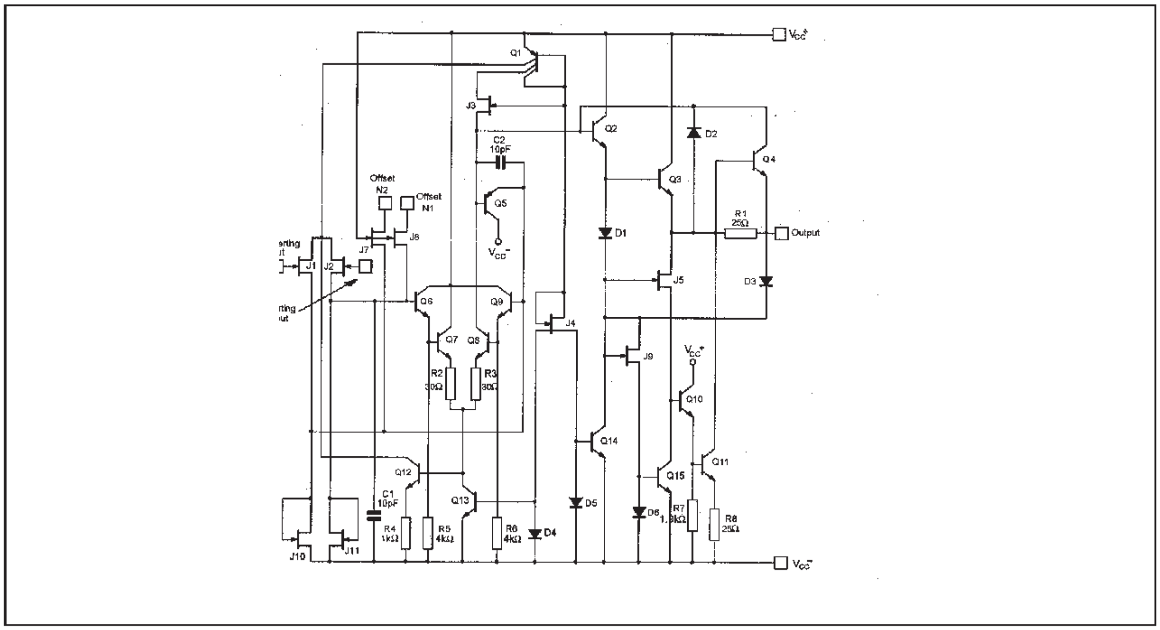
### DESCRIPTION

These circuits are monolithic J-FET input operational amplifiers incorporating well matched, high voltage J-FET on the same chip with standard bipolar transistors.

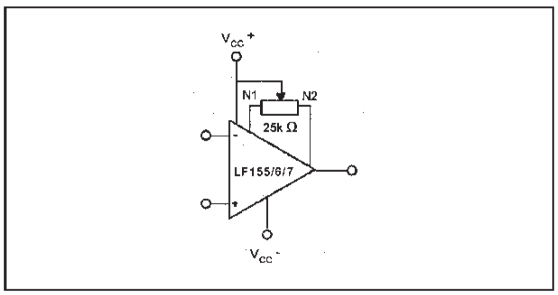
This amplifiers feature low input bias and offset currents, low input offset voltage and input offset voltage drift, coupled with offset adjust which does not degrade drift or common-mode rejection.

The devices are also designed for high slew rate, wide bandwidth, extremely fast settling time, low voltage and current noise and a low 1/f noise level.

## SCHEMATIC DIAGRAM




## Vio ADJUSTMENT




## ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | | Value | Unit |
|---|---|---|---|---|
| $V_{CC}$ | Supply Voltage | | ±22 | V |
| $V_i$ | Input Voltage - (note 1) | | ±20 | V |
| $V_{id}$ | Differential Input Voltage | | ±40 | V |
| $P_{tot}$ | Power Dissipation | | 570 | mW |
| | Output Short-circuit Duration | | Infinite | |
| $T_{oper}$ | Operating Free Air Temperature Range | LF155-LF156-LF157<br>LF255-LF256-LF257<br>LF355-LF356-LF357 | -55 to +125<br>–40 to +105<br>0 to 70 | $^oC$ |
| $T_{stg}$ | Storage Temperature Range | | –65 to 150 | $^oC$ |

## ELECTRICAL CHARACTERISTICS

**LF155, LF156, LF157** $-55^oC \le T_{amb} \le +125^oC$ $\pm5V \le V_{CC} \le \pm20V$
**LF255, LF256, LF257** $-40^oC \le T_{amb} \le +105^oC$ $\pm5V \le V_{CC} \le \pm20V$
(unless otherwise specified)

| Symbol | Parameter | LF155 - LF156 - LF157<br>LF255 - LF256 - LF257 | | | Unit |
|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | |
| $V_{io}$ | Input Offset Voltage ($R_S$ = 50Ω)<br>$T_{amb}$ = 25°C<br>$T_{min.} \le T_{amb} \le T_{max.}$ LF155, LF156, LF157<br>LF255, LF256, LF257 | | 3 | 5<br>7<br>6.2 | mV |
| $I_{io}$ | Input Offset Current - (note 3)<br>$T_{amb}$ = 25°C<br>$T_{min.} \le T_{amb} \le T_{max.}$ LF155, LF156, LF157<br>LF255, LF256, LF257 | | 3 | 20<br>20<br>1 | pA<br>nA<br>nA |
| $I_{ib}$ | Input Bias Current - (note 3)<br>$T_{amb}$ = 25°C<br>$T_{min.} \le T_{amb} \le T_{max.}$ LF155, LF156, LF157<br>LF255, LF256, LF257 | | 20 | 100<br>50<br>5 | pA<br>nA<br>nA |
| $A_{vd}$ | Large Signal Voltage Gain ($R_L$ = 2kΩ, $V_O$ = ±10V, $V_{CC}$ = ±15V)<br>$T_{amb}$ = 25°C<br>$T_{min.} \le T_{amb} \le T_{max.}$ | 50<br>25 | 200 | | V/mV |
| SVR | Supply Voltage Rejection Ratio - (note 4) | 85 | 100 | | dB |
| $I_{CC}$ | Supply Current ($V_{CC}$ = ±15V, no load)<br>$T_{amb}$ = 25°C LF155, LF255<br>LF156, LF256<br>LF157, LF257 | | 2<br>5<br>5 | 4<br>7<br>7 | mA |
| $DV_{io}$ | Input Offset Voltage Drift ($R_S$ = 50Ω) | | 5 | | μV/°C |
| $DV_{io}/V_{io}$ | Change in Average Temperature Coefficient with $V_{io}$ adjust<br>($R_S$ = 50Ω) - (note 2) | | 0.5 | | μV/°C |
| $V_{icm}$ | Input Common Mode Voltage Range ($V_{CC}$ = ±15V, $T_{amb}$ = 25°C) | ±11 | +15.1<br>-12 | | V |
| CMR | Common Mode Rejection Ratio | 85 | 100 | | dB |
| $\pm V_{OPP}$ | Output Voltage Swing ($V_{CC}$ = ±15V)<br>$R_L$ = 10kΩ<br>$R_L$ = 2kΩ | ±12<br>±10 | ±13<br>±12 | | V |
| GBP | Gain Bandwidth Product ($V_{CC}$ = ±15V, $T_{amb}$ = 25°C)<br>LF155, LF255<br>LF156, LF256<br>LF157, LF257 | | 2.5<br>5<br>20 | | MHz |
| SR | Slew Rate ($V_{CC}$ = ±15V, $T_{amb}$ = 25°C)<br>$A_V$ = 1 LF155, LF255<br>LF156, LF256<br>$A_V$ = 5 LF157, LF257 | 7.5<br>30 | 5<br>12<br>50 | | V/μs |
| $R_i$ | Input Resistance ($T_{amb}$ = 25°C) | | $10^{12}$ | | Ω |
| $C_i$ | Input Capacitance ($V_{CC}$ = ±15V, $T_{amb}$ = 25°C) | | 3 | | pF |
| $e_n$ | Equivalent Input Noise Voltage<br>($V_{CC}$ = ±15V, $T_{amb}$ = 25°C, $R_S$ = 100Ω)<br>f = 1000Hz LF155, LF255<br>LF156, LF256<br>LF157, LF257<br>f = 100Hz LF155, LF255<br>LF156, LF256<br>LF157, LF257 | | 20<br>12<br>12<br>25<br>15<br>15 | | $\frac{nV}{\sqrt{Hz}}$ |
| $i_n$ | Equivalent Input Noise Current<br>($V_{CC}$ = ±15V, $T_{amb}$ = 25°C, f = 100Hz or f = 1000Hz) | | 0.01 | | $\frac{pA}{\sqrt{Hz}}$ |
| $t_s$ | Settling Time ($V_{CC}$ = ±15V, $T_{amb}$ = 25°C) - (note 5)<br>LF155, LF255<br>LF156, LF256<br>LF157, LF257 | | 4<br>1.5<br>1.5 | | μs |

## ELECTRICAL CHARACTERISTICS

**LF355, LF356, LF357** $0^oC \leq T_{amb} \leq +70^oC$ $V_{CC} = \pm15V$, (unless otherwise specified)

| Symbol | Parameter | | LF355 - LF356 - LF357 Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_{io}$ | Input Offset Voltage ($R_S = 50\Omega$)<br>$T_{amb} = 25^oC$<br>$T_{min.} \leq T_{amb} \leq T_{max.}$ | | | 3 | 10<br>13 | mV |
| $I_{io}$ | Input Offset Current - (note 3)<br>$T_{amb} = 25^oC$<br>$T_{min.} \leq T_{amb} \leq T_{max.}$ | | | 3 | 50<br>2 | pA<br>nA |
| $I_{ib}$ | Input Bias Current - (note 3)<br>$T_{amb} = 25^oC$<br>$T_{min.} \leq T_{amb} \leq T_{max.}$ | | | 20 | 200<br>8 | pA<br>nA |
| $A_{vd}$ | Large Signal Voltage Gain ($R_L = 2k\Omega$, $V_O = \pm10V$)<br>$T_{amb} = 25^oC$<br>$T_{min.} \leq T_{amb} \leq T_{max.}$ | | 25<br>15 | 200 | | V/mV |
| SVR | Supply Voltage Rejection Ratio - (note 4) | | 80 | 100 | | dB |
| $I_{CC}$ | Supply Current (no load)<br>$T_{amb} = 25^oC$ | LF355<br>LF356, LF357 | | 2<br>5 | 4<br>10 | mA |
| $DV_{io}$ | Input Offset Voltage Drift ($R_S = 50\Omega$) - (note 2) | | | 5 | | $\mu V/^oC$ |
| $DV_{io}/V_{io}$ | Change in Average Temperature Coefficient with $V_{io}$ adjust ($R_S = 50\Omega$) | | | 0.5 | | $\mu V/^oC$ per mV |
| $V_{icm}$ | Input Common Mode Voltage Range ($T_{amb} = 25^oC$) | | ±10 | +15.1<br>-12 | | V |
| CMR | Common Mode Rejection Ratio | | 80 | 100 | | dB |
| $\pm V_{OPP}$ | Output Voltage Swing | $R_L = 10k\Omega$<br>$R_L = 2k\Omega$ | ±12<br>±10 | ±13<br>±12 | | V |
| GBP | Gain Bandwidth Product $T_{amb} = 25^oC$) | LF355<br>LF356<br>LF357 | | 2.5<br>5<br>20 | | MHz |
| SR | Slew Rate ($T_{amb} = 25^oC$)<br>$A_V = 1$<br><br>$A_V = 5$ | LF355<br>LF356<br>LF357 | | 5<br>12<br>50 | | V/µs |
| $R_i$ | Input Resistance ($T_{amb} = 25^oC$) | | | $10^{12}$ | | Ω |
| $C_i$ | Input Capacitance (Tamb = $25^oC$) | | | 3 | | pF |
| $e_n$ | Equivalent Input Noise Voltage ($T_{amb} = 25^oC$, $R_S = 100\Omega$)<br>f = 1000Hz<br><br>f = 100Hz | LF355<br>LF356, LF357<br>LF355<br>LF356, LF357 | | 20<br>12<br>25<br>15 | | $\frac{nV}{\sqrt{Hz}}$ |
| $i_n$ | Equivalent Input Noise Current<br>($T_{amb} = 25^oC$, f = 100Hz or f = 1000Hz) | | | 0.01 | | $\frac{pA}{\sqrt{Hz}}$ |
| $t_s$ | Settling Time ($T_{amb} = 25^oC$) - (note 5) | LF355<br>LF356, LF357 | | 4<br>1.5 | | µs |

**Notes :**
1. Unless otherwise specified the absolute maximum negative input voltage is equal to the negative power supply voltage.
2. The temperature coefficient of the adjusted input offset voltage changes only a small amount (0.5$\mu V/^oC$ typically) for each mV of adjustment from its original unadjusted value. Common-mode rejection and open loop voltage gain are alsounaffected by offset adjustment.
3. The input bias currents are junction leakage currents which approximately double for every $10^oC$ increase in the junction temperature $T_{amb}$. Due to limited production test time, the input bias current measured is correlated to junction temperature. In a normal operation the junction temperature rises above the ambient temperature as a result of internal power dissipation, $P_{tot}$-$T_{amb}$ =$T_{amb}$ +$R_{th(j-a)}$x$P_{tot}$ where $Rt_{h(j-a)}$ is the thermal resistance from junction to ambient. Use of a heatsink is recommended f input currents are to be kept to a minimum.
4. Supply voltage rejection is measured for both supply magnitudes increasing or decreasing simultaneously, in accordance with common practise.
5. Settling time is defined here, for a unity gain inverter connection using 2kΩ resistors for the LF155, LF156 series. It is the time required for the error voltage (the voltage at the inverting input pin on the amplifier) to settle to within 0.01% of its final value from the time a 10V step input is applied to the inverter. For the LF157 series $A_V$ = -5, the feedback resistor from output to input is 2kΩ and the output step is 10V.

## APPLICATION HINTS

The LF155, LF156, LF157 series are op amps with J-FETinput transistors. TheseJFETs havelarge reverse breakdown voltagesfromgatetosource or drain eliminatingtheneed of clamps across the inputs. Therefore large differential input voltages can easily be accommodatedwithouta large increaseof inputcurrents. The maximum differential input voltage is independent of the supply voltage. However, neitherof thenegative input voltagesshould be allowed to exceedthe negative supply as this will cause large currents to flow which can result in a destroyed unit. Exceeding the negative common-mode limit on either inputwill causeareversal of thephasetotheoutputandforce the amplifier output to the correspondinghigh or lowstate. Exceedingthe negativecommon-mode limit on bothinputs will force the amplifier outputto a high state. In neither case does a latch occur since raising the input back within the common-mode range again puts the input stage and thustheamplifier in a normal operating mode. Exceedingthepositive common-modelimit on asingle input will not changethephase of the output however, if bothinputsexceedthe limit, theoutput of theamplifier will be forcedto a high state. These amplifiers will operatewith the common-mode input voltage equal to the positive supply. In fact, the common-modevoltagecanexceedthepositivesupplyby approximately 100mV independentof supply volt-age and over thefull operatingtemperaturerange.The positive suplly can thereforebe used as a referenceonaninput as, forexample, in a supply current monitor and/or limiter. Precautionsshould be taken to ensurethat thepower supply for the integrated circuit never becomes re-versed in polarity or that the unit is not inadvertentlyin-stalled backwards in a socket as an unilimited current surge throughthe resulting forward diode within the IC couldcausefusingoftheinternal conductorsandresultin a destroyedunit.

Because these amplifiers are JFET rather than MOS-FET input op amps they do not require special handling.

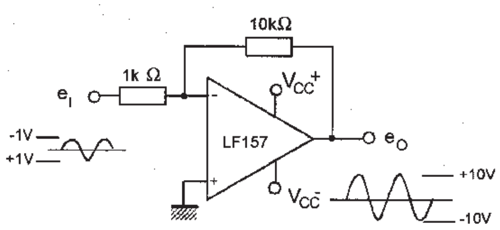
All of the bias currents in these amplifiers are set by FET current sources. The drain currents for the amplifiers are therefore essentially independent of supply voltages.

As with most amplifiers, care should betaken with lead dress, components placement and supply decoupling in order to ensure stability. For example, resistors from the output to an input should be placed with the body close to theinput to minimiz "pickup" and maximize the frequency of the feedback pole by minimizing the capacitancefrom the input to ground.

A feedback pole is createdwhen the feedbackaround any amplifier is resistive. The parallel resistance and capacitancefromthe input of thedevice(usually the invertinginput)toacgroundsetthefrequencyofthepole. In many instances the frequency of this pole is much greaterthanthe expected3 dBfrequencyof the closed loopgain and consequentlythereisnegligible effect on stability margin. However, if the feedback pole is less than approximately six time the expected 3 dB frequencyaleadcapacitor should be placed from the output to the input of the op amp. The value of that added capacitor should be such that the RC time constant of this capacitor and the resistance it parallels is greater than or equal to the original feedback pole time constant.

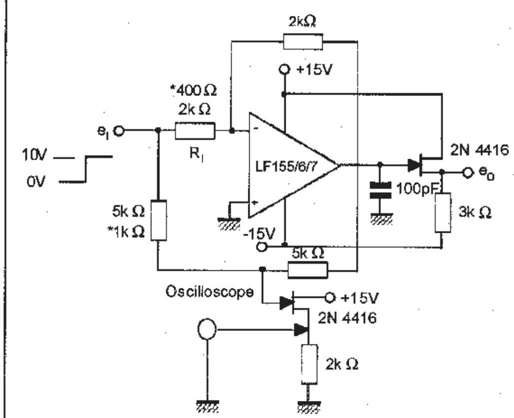
## TYPICAL CIRCUITS

### LARGE POWER BW AMPLIFIER

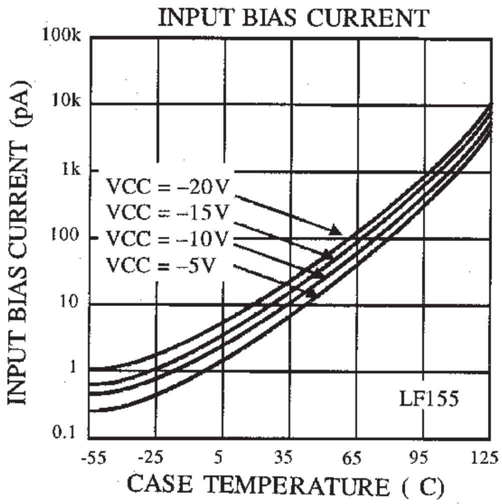


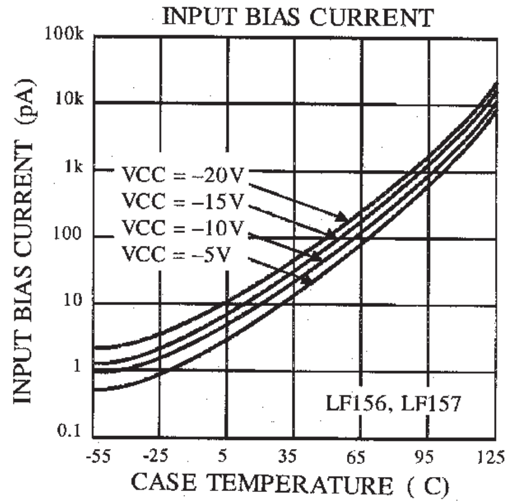

For distortion < 1% and a 20 $V_{PP}$ $V_O$ swing, power bandwidth is : 500kHz

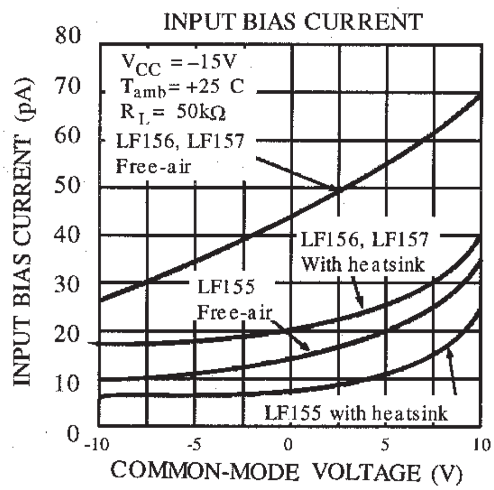
### SETTLING TIME TEST CIRCUIT

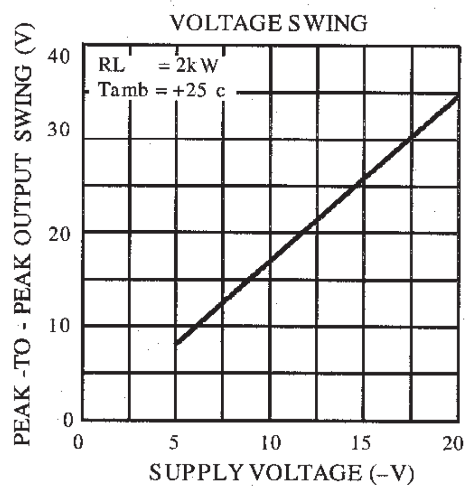


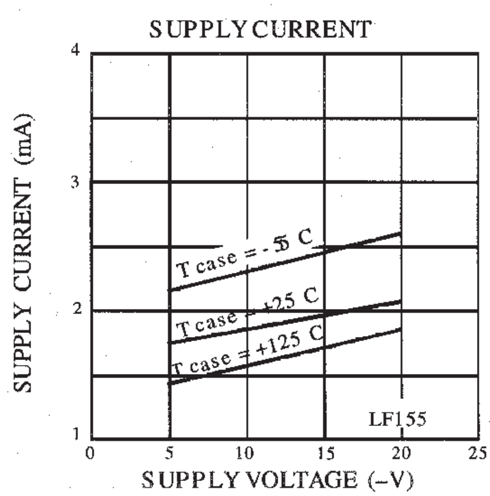

Settling time is tested with the LF155, LF156 connected as unity gain converter $R_I = 2k\Omega$ and LF157 connected for $A_V = -5$, $R_I = 0.4k\Omega$

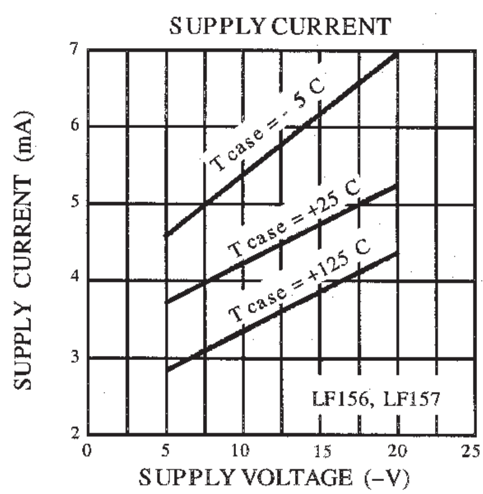

INPUT BIAS CURRENT
INPUT BIAS CURRENT (pA)
100k
10k
1k
100
10
1
0.1
VCC = −20V
VCC = −15V
VCC = −10V
VCC = −5V
LF155
-55
-25
5
35
65
95
125
CASE TEMPERATURE ( C)


INPUT BIAS CURRENT
INPUT BIAS CURRENT (pA)
100k
10k
1k
100
10
1
0.1
VCC = −20V
VCC = −15V
VCC = −10V
VCC = −5V
LF156, LF157
-55
-25
5
35
65
95
125
CASE TEMPERATURE ( C)

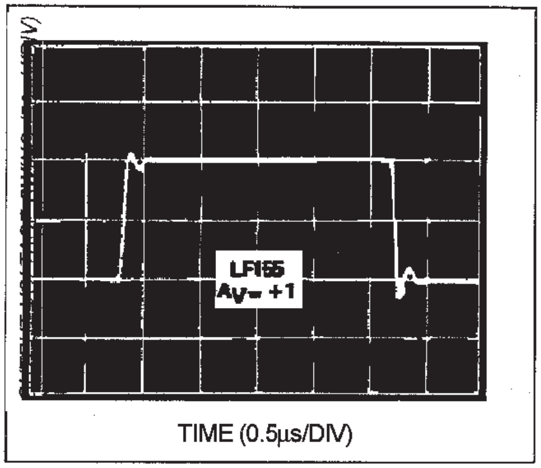

INPUT BIAS CURRENT
INPUT BIAS CURRENT (pA)
80
70
60
50
40
30
20
10
0
VCC = −15V
Tamb = +25 C
RL = 50kΩ
LF156, LF157
Free-air
LF156, LF157
With heatsink
LF155
Free-air
LF155 with heatsink
-10
-5
0
5
10
COMMON-MODE VOLTAGE (V)


VOLTAGE SWING
PEAK -TO - PEAK OUTPUT SWING (V)
40
30
20
10
0
RL = 2kW
Tamb = +25 c
0
5
10
15
20
SUPPLY VOLTAGE (−V)

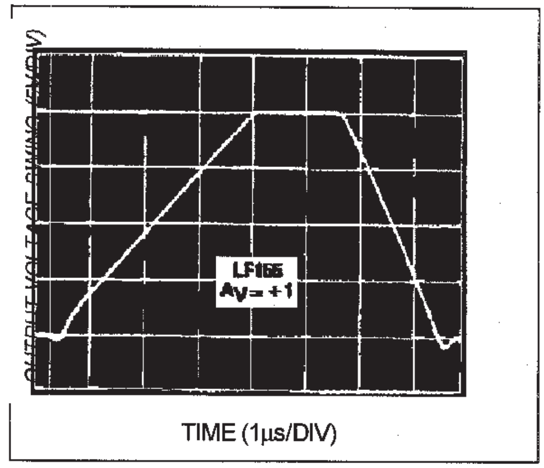

SUPPLY CURRENT
SUPPLY CURRENT (mA)
4
3
2
1
T case = - 55 C
T case = +25 C
T case = +125 C
LF155
0
5
10
15
20
25
SUPPLY VOLTAGE (−V)


SUPPLY CURRENT
SUPPLY CURRENT (mA)
7
6
5
4
3
2
T case = - 5 C
T case = +25 C
T case = +125 C
LF156, LF157
0
5
10
15
20
25
SUPPLY VOLTAGE (−V)

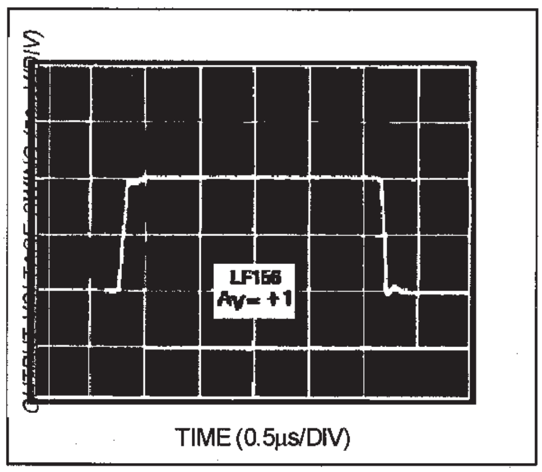
SMALL SIGNAL PULSE RESPONSE



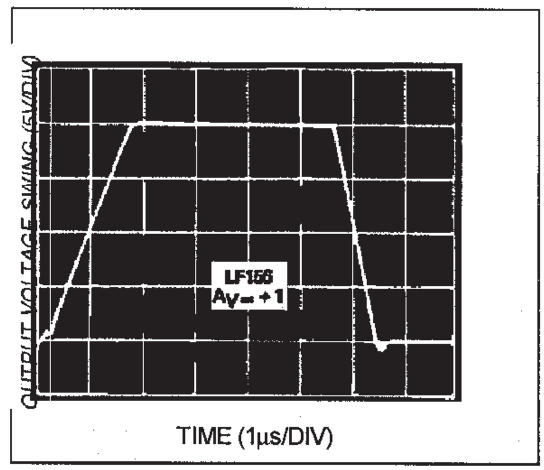

SMALL SIGNAL PULSE RESPONSE



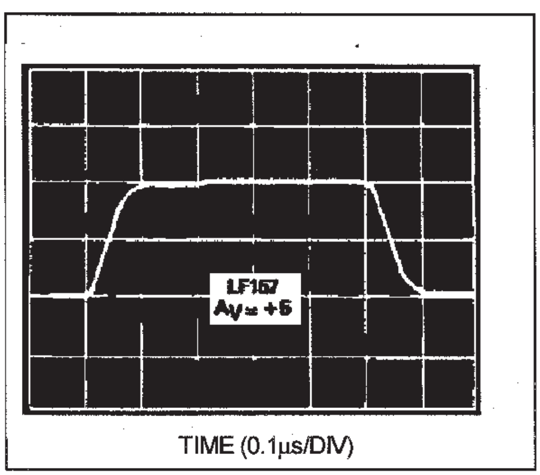

SMALL SIGNAL PULSE RESPONSE



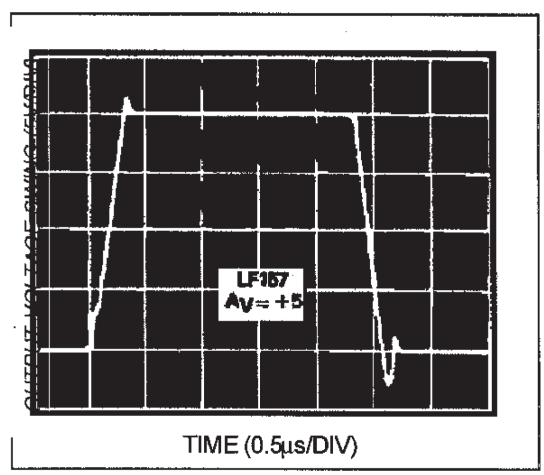

SMALL SIGNAL PULSE RESPONSE

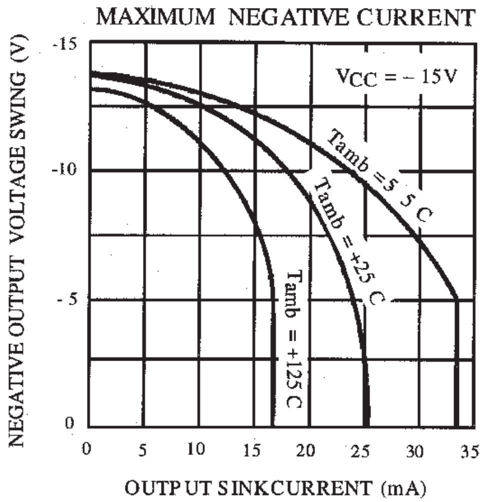


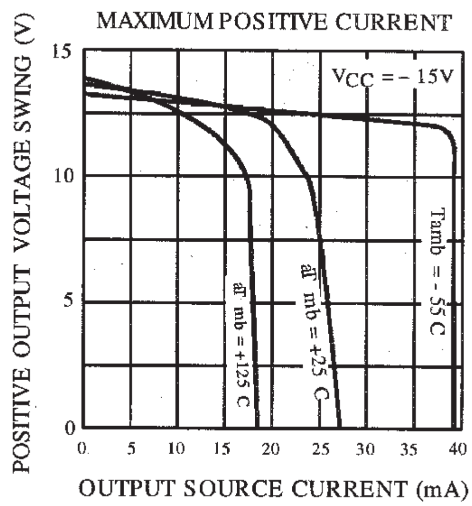

SMALL SIGNAL PULSE RESPONSE

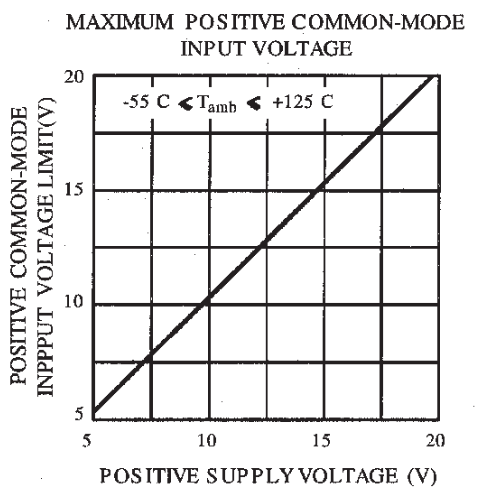


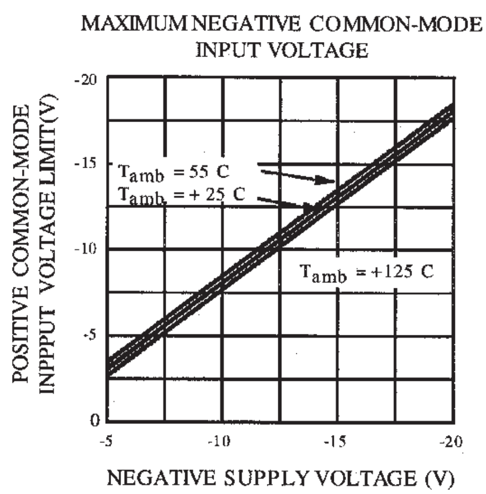

SMALL SIGNAL PULSE RESPONSE

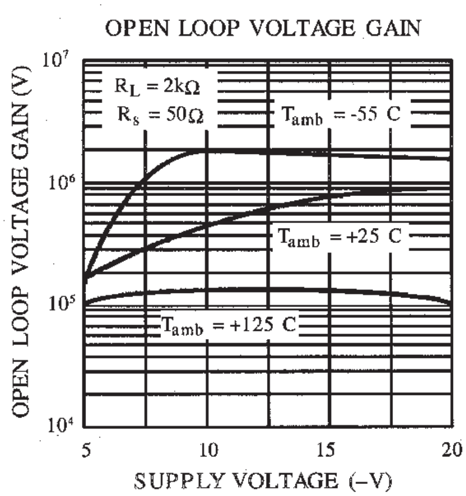


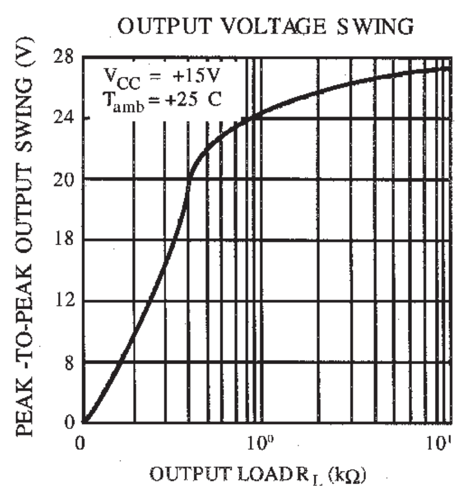

MAXIMUM NEGATIVE CURRENT
NEGATIVE OUTPUT VOLTAGE SWING (V)
OUTPUT SINK CURRENT (mA)
VCC = – 15V
Tamb = 5 5 C
Tamb = +25 C
Tamb = +125 C

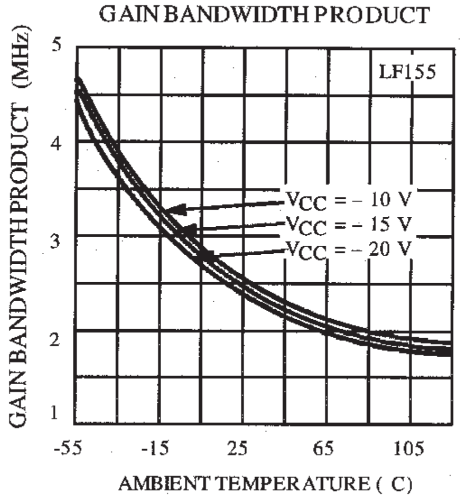

MAXIMUM POSITIVE CURRENT
POSITIVE OUTPUT VOLTAGE SWING (V)
OUTPUT SOURCE CURRENT (mA)
VCC = – 15V
Tamb = - 55 C
aT mb = +25 C
aT mb = +125 C

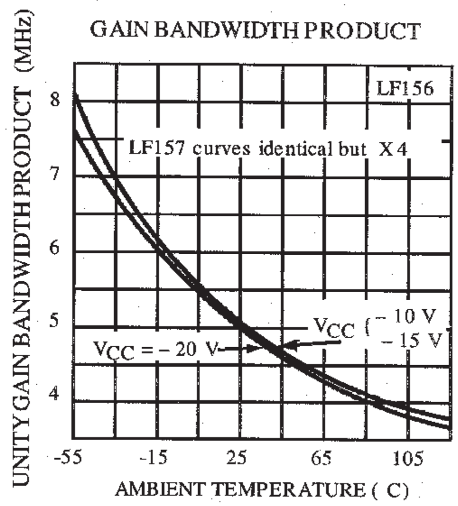

MAXIMUM POSITIVE COMMON-MODE INPUT VOLTAGE
POSITIVE COMMON-MODE INPPUT VOLTAGE LIMIT(V)
POSITIVE SUPPLY VOLTAGE (V)
-55 C < Tamb < +125 C

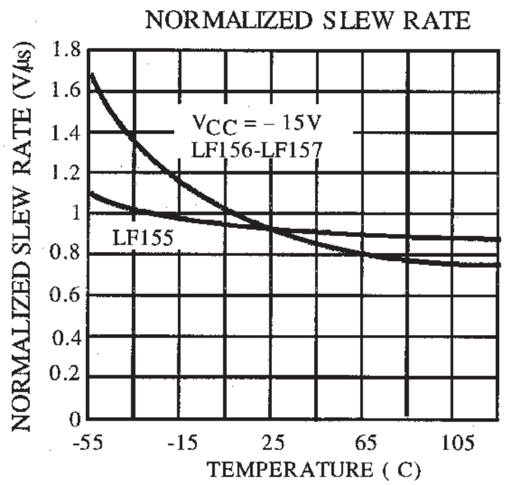

MAXIMUM NEGATIVE COMMON-MODE INPUT VOLTAGE
POSITIVE COMMON-MODE INPPUT VOLTAGE LIMIT(V)
NEGATIVE SUPPLY VOLTAGE (V)
Tamb = 55 C
Tamb = + 25 C
Tamb = +125 C

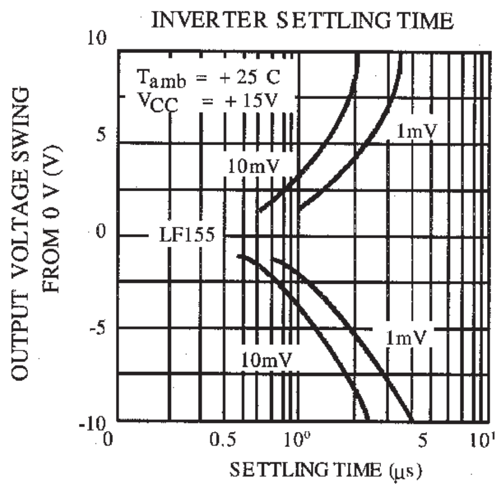

OPEN LOOP VOLTAGE GAIN
OPEN LOOP VOLTAGE GAIN (V)
SUPPLY VOLTAGE (–V)
RL = 2kΩ
Rs = 50Ω
Tamb = -55 C
Tamb = +25 C
Tamb = +125 C

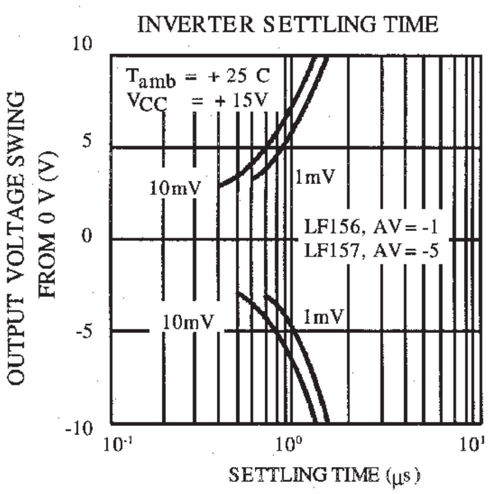

OUTPUT VOLTAGE SWING
PEAK -TO-PEAK OUTPUT SWING (V)
OUTPUT LOAD RL (kΩ)
VCC = +15V
Tamb = +25 C

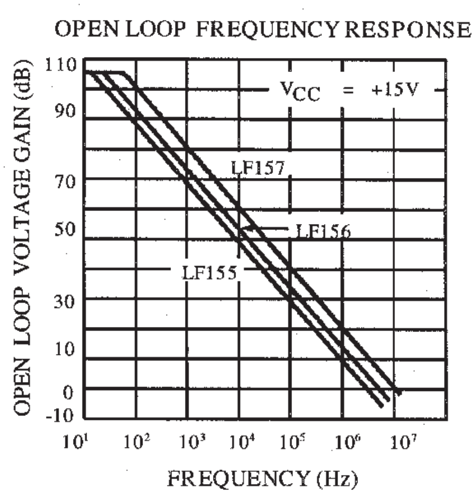

GAIN BANDWIDTH PRODUCT
LF155
VCC = – 10 V
VCC = – 15 V
VCC = – 20 V
GAIN BANDWIDTH PRODUCT (MHz)
AMBIENT TEMPERATURE ( C)
5
4
3
2
1
-55
-15
25
65
105

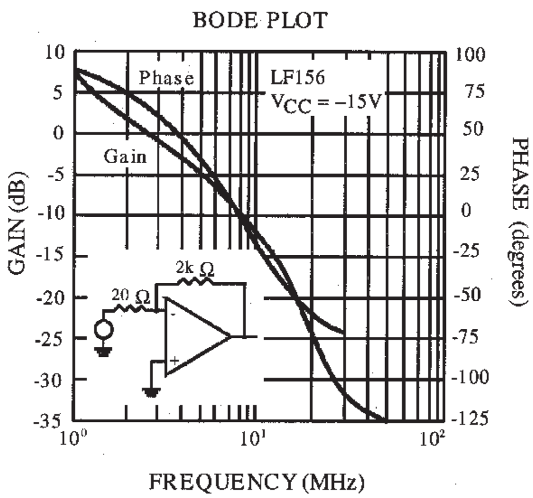

GAIN BANDWIDTH PRODUCT
LF156
LF157 curves identical but X 4
VCC – 10 V
– 15 V
VCC = – 20 V
UNITY GAIN BANDWIDTH PRODUCT (MHz)
AMBIENT TEMPERATURE ( C)
8
7
6
5
4
-55
-15
25
65
105

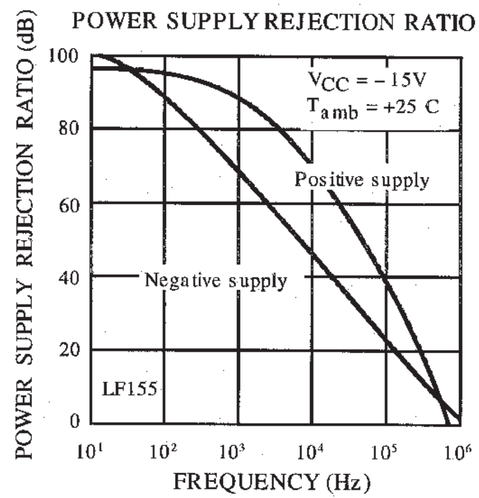

NORMALIZED SLEW RATE
VCC = – 15V
LF156-LF157
LF155
NORMALIZED SLEW RATE (V/µs)
TEMPERATURE ( C)
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
-55
-15
25
65
105

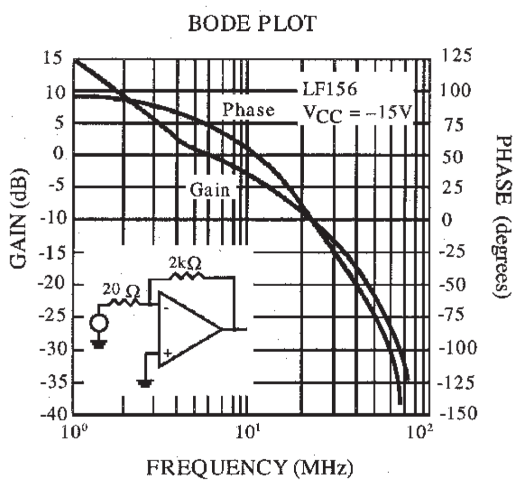

INVERTER SETTLING TIME
Tamb = + 25 C
VCC = + 15V
10mV
1mV
LF155
10mV
1mV
OUTPUT VOLTAGE SWING
FROM 0 V (V)
SETTLING TIME (µs)
10
5
0
-5
-10
0
0.5
10⁰
5
10¹

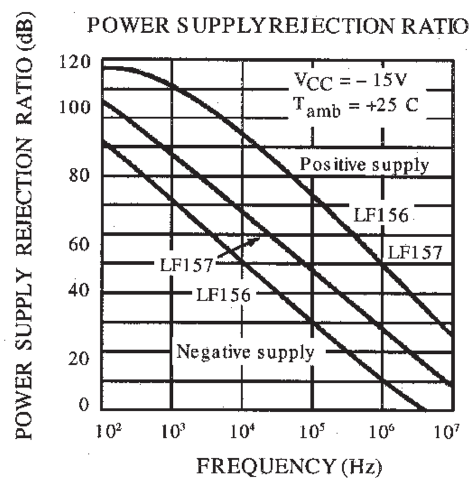

INVERTER SETTLING TIME
Tamb = + 25 C
VCC = + 15V
10mV
1mV
LF156, AV= -1
LF157, AV= -5
10mV
1mV
OUTPUT VOLTAGE SWING
FROM 0 V (V)
SETTLING TIME (µs)
10
5
0
-5
-10
10⁻¹
10⁰
10¹

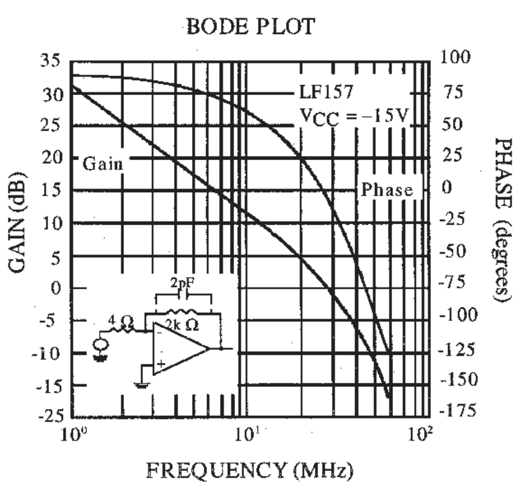

OPEN LOOP FREQUENCY RESPONSE
VCC = +15V
LF157
LF156
LF155
OPEN LOOP VOLTAGE GAIN (dB)
FREQUENCY (Hz)
110
90
70
50
30
10
0
-10
10¹
10²
10³
10⁴
10⁵
10⁶
10⁷

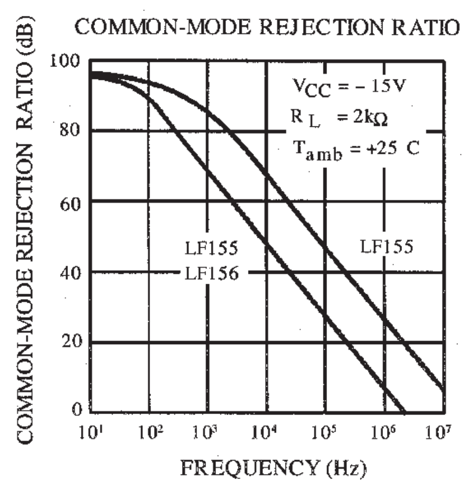

BODE PLOT
Phase
Gain
LF156
VCC = -15V
2k Ω
20 Ω
GAIN (dB)
PHASE (degrees)
FREQUENCY (MHz)

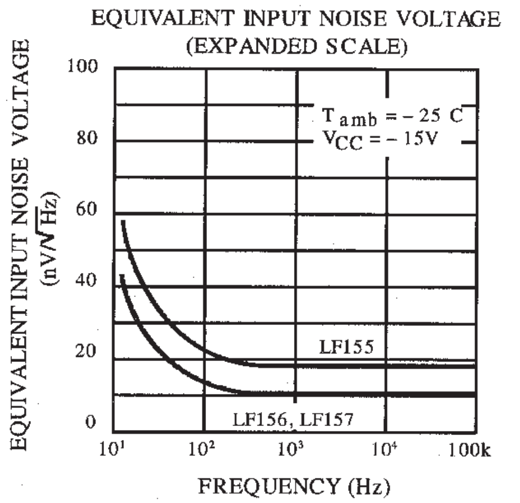

POWER SUPPLY REJECTION RATIO
VCC = - 15V
Tamb = +25 C
Positive supply
Negative supply
LF155
POWER SUPPLY REJECTION RATIO (dB)
FREQUENCY (Hz)

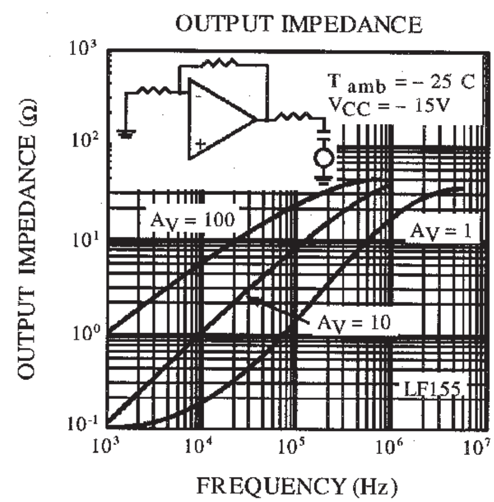

BODE PLOT
LF156
VCC = -15V
Phase
Gain
2kΩ
20 Ω
GAIN (dB)
PHASE (degrees)
FREQUENCY (MHz)

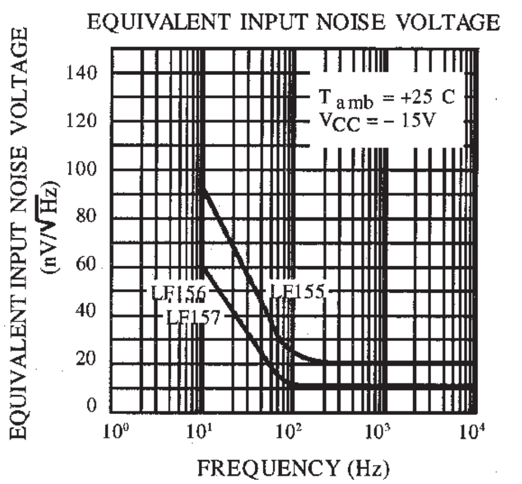

POWER SUPPLY REJECTION RATIO
VCC = - 15V
Tamb = +25 C
Positive supply
LF156
LF157
LF157
LF156
Negative supply
POWER SUPPLY REJECTION RATIO (dB)
FREQUENCY (Hz)

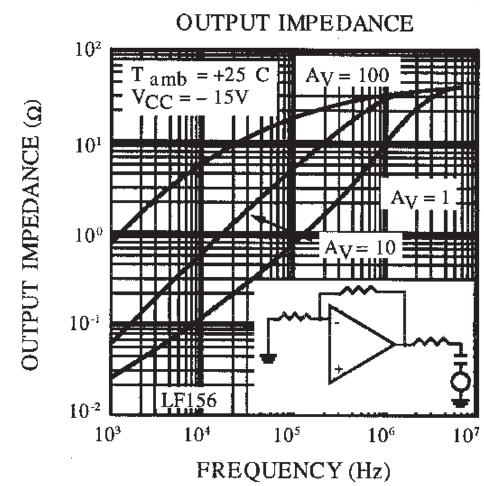

BODE PLOT
LF157
VCC = -15V
Gain
Phase
2pF
4 Ω
2k Ω
GAIN (dB)
PHASE (degrees)
FREQUENCY (MHz)

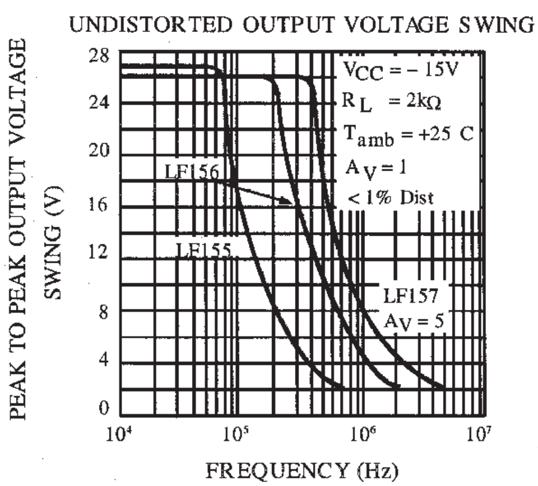

COMMON-MODE REJECTION RATIO
VCC = - 15V
RL = 2kΩ
Tamb = +25 C
LF155
LF156
LF155
COMMON-MODE REJECTION RATIO (dB)
FREQUENCY (Hz)

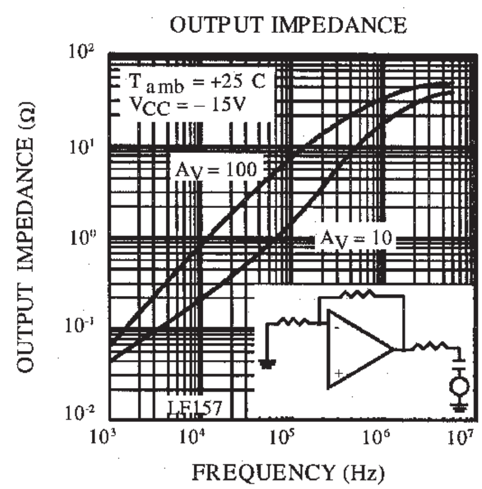

EQUIVALENT INPUT NOISE VOLTAGE
(EXPANDED SCALE)
EQUIVALENT INPUT NOISE VOLTAGE (nV/√Hz)
T amb = – 25 C
VCC = – 15V
LF155
LF156, LF157
FREQUENCY (Hz)


OUTPUT IMPEDANCE
OUTPUT IMPEDANCE (Ω)
T amb = – 25 C
VCC = – 15V
AV = 100
AV = 1
AV = 10
LF155
FREQUENCY (Hz)

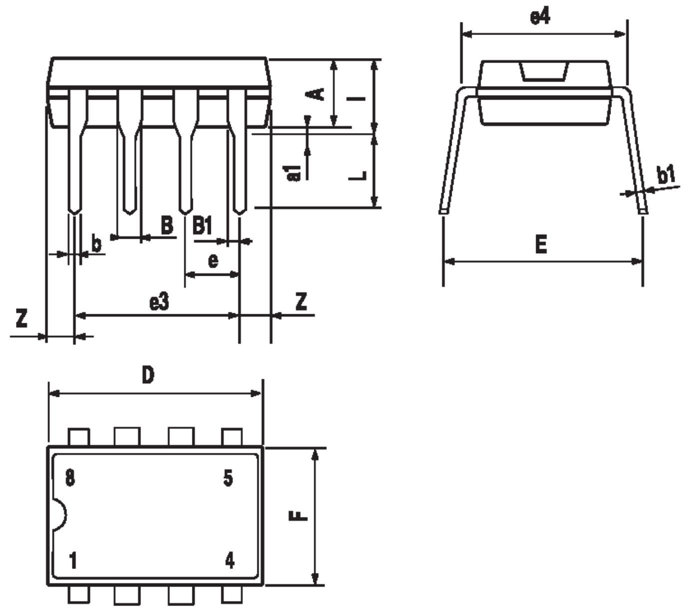

EQUIVALENT INPUT NOISE VOLTAGE
EQUIVALENT INPUT NOISE VOLTAGE (nV/√Hz)
T amb = +25 C
VCC = – 15V
LF156
LF157
LF155
FREQUENCY (Hz)


OUTPUT IMPEDANCE
OUTPUT IMPEDANCE (Ω)
T amb = +25 C
VCC = – 15V
AV = 100
AV = 1
AV = 10
LF156
FREQUENCY (Hz)


UNDISTORTED OUTPUT VOLTAGE SWING
PEAK TO PEAK OUTPUT VOLTAGE SWING (V)
VCC = – 15V
RL = 2kΩ
Tamb = +25 C
AV = 1
< 1% Dist
LF156
LF155
LF157
AV = 5
FREQUENCY (Hz)


OUTPUT IMPEDANCE
OUTPUT IMPEDANCE (Ω)
T amb = +25 C
VCC = – 15V
AV = 100
AV = 10
LF157
FREQUENCY (Hz)

## PACKAGE MECHANICAL DATA
8 PINS - PLASTIC DIP



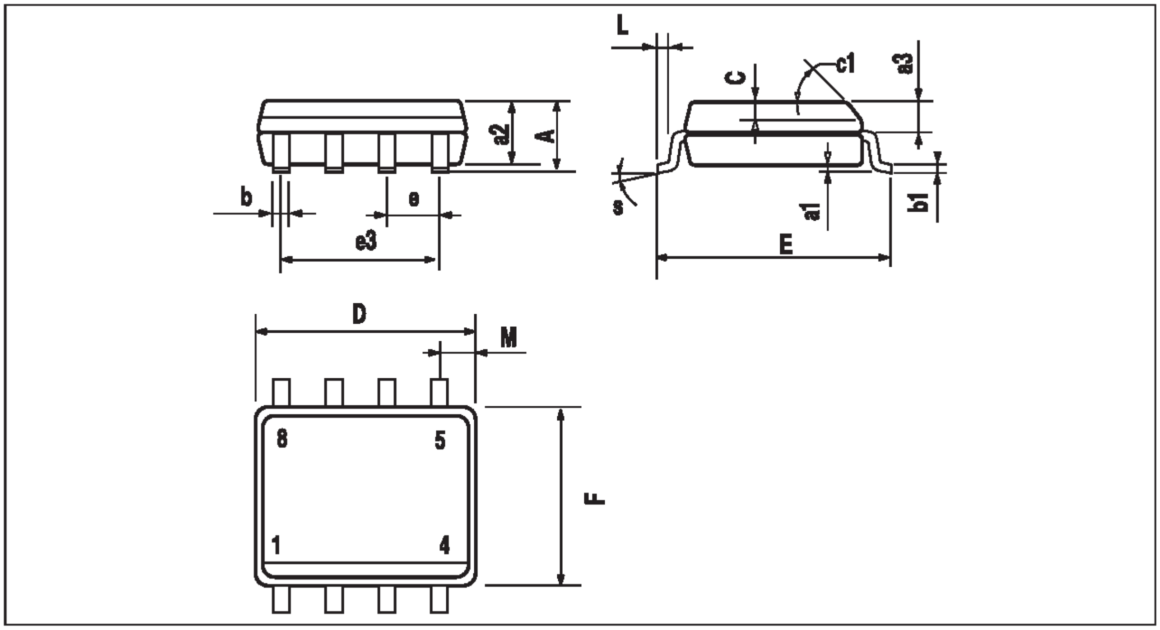

PM-DIP8.EPS

| 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 | | | 0260 |
| 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)




PM-SO8.EPS

| 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 | $45^o$ (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 | $8^o$ (max.) | | | | | |

SO8.TBL



ORDER CODE :