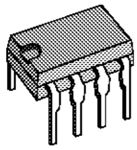
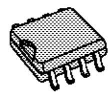
NE532 - SA532

LOW POWER DUAL OPERATIONAL AMPLIFIERS

- INTERNALLY FREQUENCY COMPENSATED
- LARGE DC VOLTAGE GAIN : 100dB
- WIDE BANDWIDTH (unity gain) : 1.1MHz (temperature compensated)
- VERY LOW SUPPLY CURRENT/AMPLI (500μA) - ESSENTIALLY INDEPENDENT OF SUPPLY VOLTAGE
- LOW INPUT BIAS CURRENT : 20nA (temperature compensated)
- LOW INPUT OFFSET VOLTAGE : 2mV
- LOW INPUT OFFSET CURRENT : 2nA
- INPUT COMMON-MODE VOLTAGE RANGE INCLUDES GROUND
- DIFFERENTIAL INPUT VOLTAGE RANGE EQUAL TO THE POWER SUPPLY VOLTAGE
- LARGE OUTPUT VOLTAGE SWING 0V TO (V_{CC} – 1.5V)



N
DIP8
(Plastic Package)



D
SO8
(Plastic Micropackage)

ORDER CODES

Part Number	Temperature Range	Package	
		N	D
SA532	–40°C, +105°C	•	•
NE532	0°C, +70°C	•	•
Example : NE532N			

DESCRIPTION

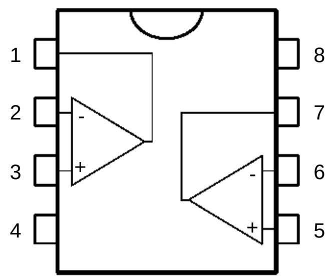
These circuits consist of two independent, high gain, internally frequency compensated which were designed specifically to operate from a single power supply over a wide range of voltages. The low power supply drain is independent of the magnitude of the power supply voltage.

Application areas include transducer amplifiers, dc gain blocks and all the conventional op-amp circuits which now can be more easily implemented in single power supply systems. For example, these circuits can be directly operated off the standard + 5V power supply voltage which is used in logic systems and will easily provide the required interface electronics without requiring any additional power supply.

In the linear mode the input common-mode voltage range includes ground and the output voltage can also swing to ground, even though operated from only a single power supply voltage.

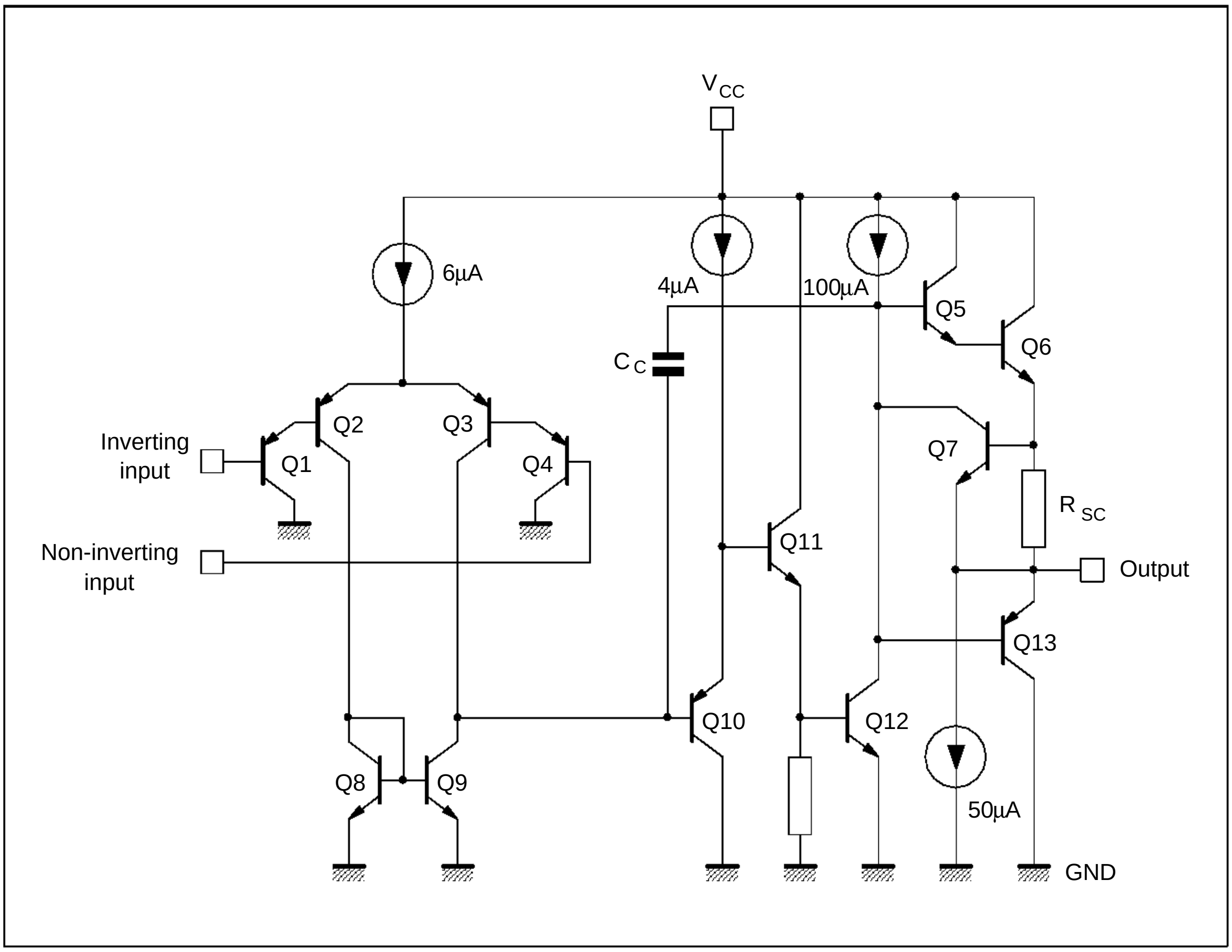
The gain-bandwidth product is temperature compensated.

PIN CONNECTIONS (top view)



1 - Output 1
2 - Inverting input 1
3 - Non-inverting input 1
4 - V_{CC}^{-}
5 - Non-inverting input 2
6 - Inverting input 2
7 - Ouput 2
8 - V_{CC}^{+}

SCHEMATIC DIAGRAM (1/2 NE532-SA532)



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	SA532	NE532	Unit
V_{CC}	Supply Voltage	+32	+32	V
V_i	Input Voltage	–0.3 to +32	–0.3 to +32	V
V_{id}	Differential Input Voltage	+32	+32	V
	Output Short-circuit Duration - (note 2)	Infinite		
P_{tot}	Power Dissipation	500	500	mW
I_{in}	Input Current - (note 1)	50	50	mA
T_{oper}	Operating Free-air Temperature Range	–40 to +105	0 to +70	°C
T_{stg}	Storage Temperature Range	–65 to +150	–65 to +150	°C

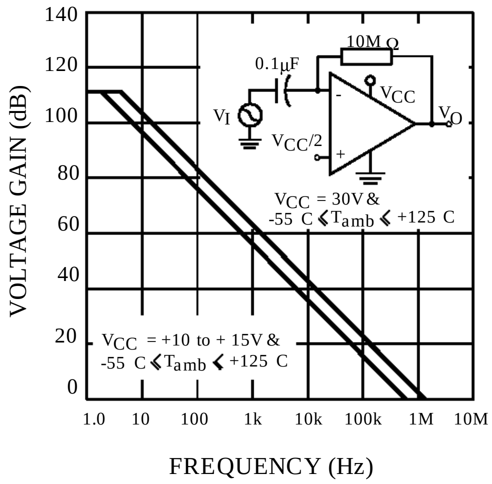
Notes :
1. This input current only exist when the voltage at any of the input leads is driven negative. It is due to the collector-base junction of the input PNP transistor becoming forward biased and thereby acting as input diode clamps.
   In addition to this diode action, there is also NPN parasitic action on the IC chip. This transistor action can cause the output voltages of the Op-amps to go to the V_{CC} voltage level (or to ground for a large overdrive) for the time duration that an input is driven negative.
   This is not destructive and normal output will set up again for input voltage higher than –0.3V.
2. Short-circuits from the output to V_{CC} can cause excessive heating if $V_{CC}^+ > 15V$. The maximum output current is approximatively 40mA independent of the magnitude of V_{CC}. Destructive dissipation can result from simultaneous short-circuits on all amplifiers.
3. $V_O = 1.4V$, $R_S = 0\Omega$, $5V < V_{CC}^+ < 30V$, $0 < V_{ic} < V_{CC}^+ - 1.5V$.
4. The direction of the input current is out of the IC. This current is essentially constant, independent of the state of the output so no loading change exists on the input lines.

ELECTRICAL CHARACTERISTICS

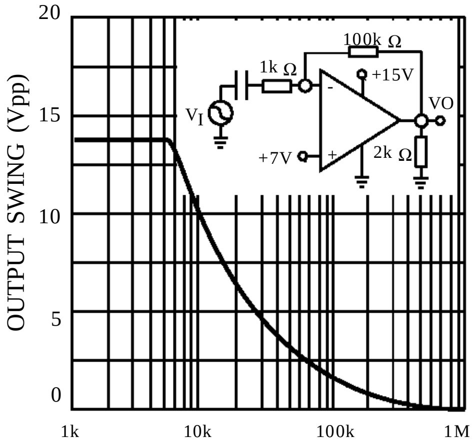
V_{CC}^+ = +5V, V_{CC}^- = Ground, V_O = 1.4V, T_{amb} = 25°C (unless otherwise specified)

Symbol	Parameter	NE532 - SA532			Unit
		Min.	Typ.	Max.	
V_{io}	Input Offset Voltage - (note 3) T_{amb} = 25°C NE532 SA532 $T_{min.} \le T_{amb} \le T_{max.}$ NE532 SA532		2	7 5 9 7	mV
I_{io}	Input Offset Current T_{amb} = 25°C $T_{min.} \le T_{amb} \le T_{max.}$		2	30 40	nA
I_{ib}	Input Bias Current - (note 4) T_{amb} = 25°C $T_{min.} \le T_{amb} \le T_{max.}$		20	150 200	nA
A_{vd}	Large Signal Voltage Gain (V_{CC} = +15V, R_L = 2kΩ, V_O = 1.4V to 11.4V) T_{amb} = 25°C $T_{min.} \le T_{amb} \le T_{max.}$	50 25	100		V/mV
SVR	Supply Voltage Rejection Ratio (R_S = 10kΩ) (V_{CC}^+ = 5 to 30V) T_{amb} = 25°C $T_{min.} \le T_{amb} \le T_{max.}$	65 65	100		dB
I_{CC}	Supply Current, all Amp, no Load V_{CC} = +5V, $T_{min.} \le T_{amb} \le T_{max.}$ V_{CC} = +30V, $T_{min.} \le T_{amb} \le T_{max.}$		0.7	1.2 2	mA
V_{icm}	Input Common Mode Voltage Range (V_{CC} = +30V) - (note 6) T_{amb} = 25°C $T_{min.} \le T_{amb} \le T_{max.}$	0 0		V_{CC}^+–1.5 V_{CC}^+–2	V
CMR	Common-mode Rejection Ratio (R_S = 10kΩ) T_{amb} = 25°C $T_{min.} \le T_{amb} \le T_{max.}$	70 60	85		dB
I_O	Output Short Circuit Current (V_{CC} = +15V, V_o = 2V, V_{id} = +1V)	20	40	60	mA
I_{sink}	Output Current Sink (V_{id} = -1V) V_{CC} = +15V, V_O = 2V V_{CC} = +15V, V_O = +0.2V	10 12	20 50		mA µA
V_{OPP}	Output Voltage Swing (R_L = 2kΩ) T_{amb} = 25°C $T_{min.} \le T_{amb} \le T_{max.}$	0 0		V_{CC}^+–1.5 V_{CC}^+–2	V
V_{OH}	High Level Output Voltage (V_{CC}^+ = 30V) T_{amb} = 25°C R_L = 2kΩ $T_{min.} \le T_{amb} \le T_{max.}$ T_{amb} = 25°C R_L = 10kΩ $T_{min.} \le T_{amb} \le T_{max.}$	26 26 27 27	27 28		V
V_{OL}	Low Level Output Voltage (R_L = 10kΩ) T_{amb} = 25°C $T_{min.} \le T_{amb} \le T_{max.}$		5	20 20	mV
SR	Slew Rate (V_{CC} = 15V, V_I = 0.5 to 3V, R_L = 2kΩ, C_L = 100pF, T_{amb} = 25°C, unity gain)	0.3	0.6		V/µs
GBP	Gain Bandwidth Product (V_{CC} = 30V, f = 100kHz, T_{amb} = 25°C, V_{in} = 10mV, R_L = 2kΩ, C_L = 100pF)	0.7	1.1		MHz
THD	Total Harmonic Distortion (f = 1kHz, A_v = 20dB, R_L = 2kΩ, V_{CC} = 30V, C_L = 100pF, T_{amb} = 25°C, V_O = 2 $_{PP}$)		0.02		%
e_n	Equivalent Input Noise voltage (f = 1kHz, R_s = 100Ω, V_{CC} = 30V)		45		$\frac{nV}{\sqrt{Hz}}$
V_{O1}/V_{O2}	Channel Separation A_V = 100		120		dB

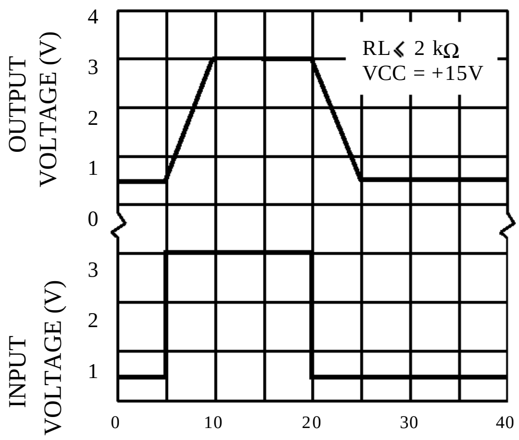
OPEN LOOP FREQUENCY RESPONSE (NOTE 3)



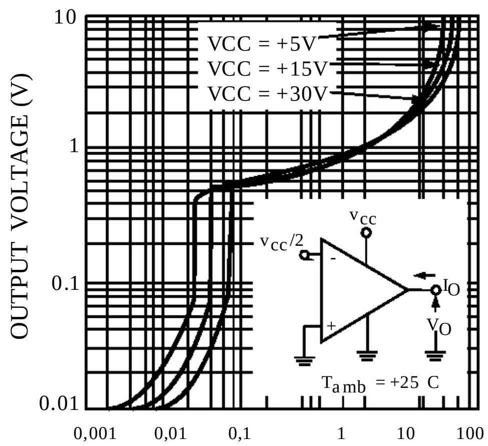
LARGE SIGNAL FREQUENCY RESPONSE



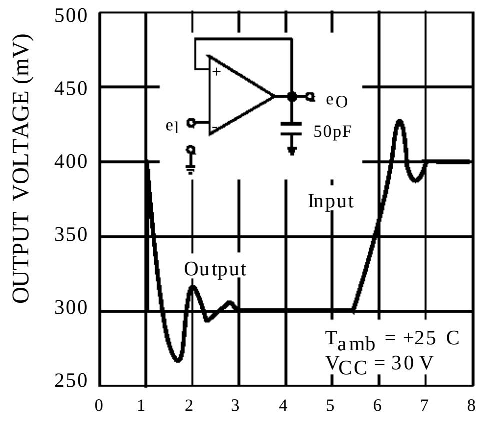
VOLTAGE FOLLOWER PULSE RESPONSE



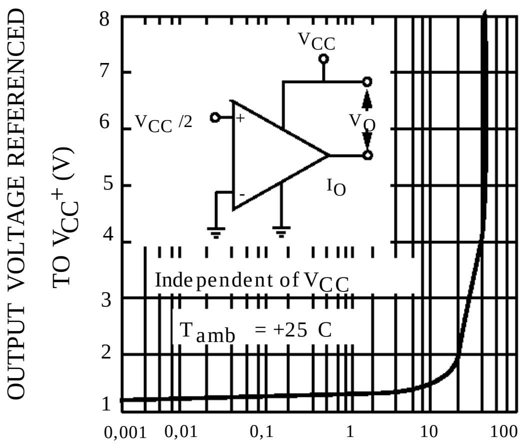
OUTPUT CHARACTERISTICS



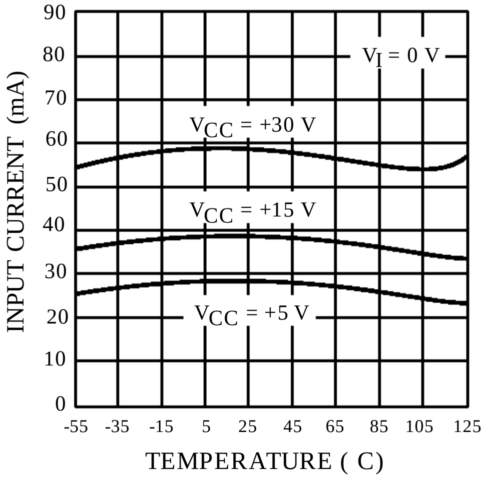
VOLTAGE FOLLOWER PULSE RESPONSE (SMALL SIGNAL)



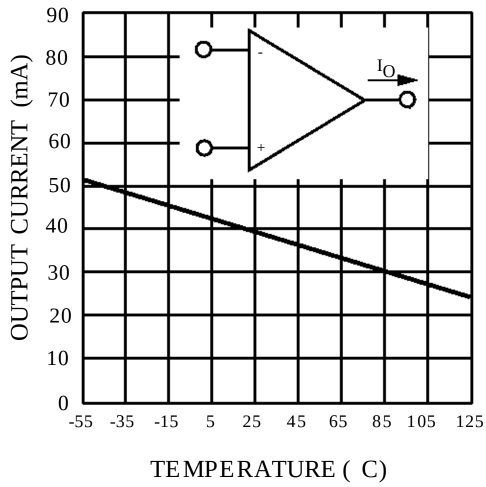
OUTPUT CHARACTERISTICS



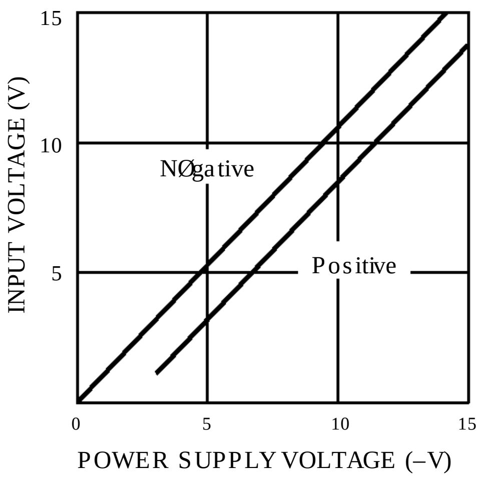
INPUT CURRENT (Note 1)



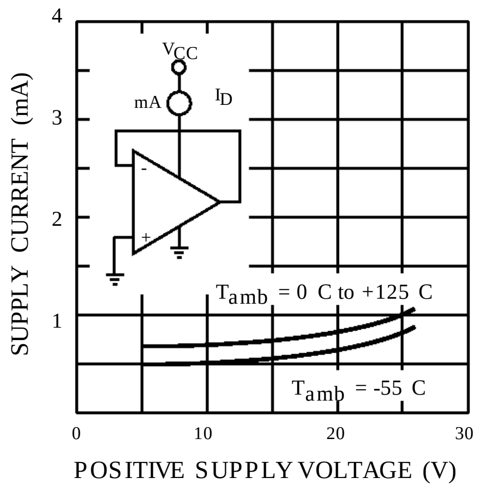
CURRENT LIMITING (Note 1)

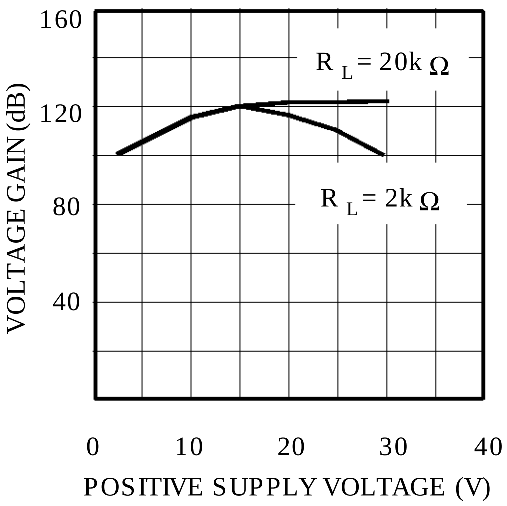


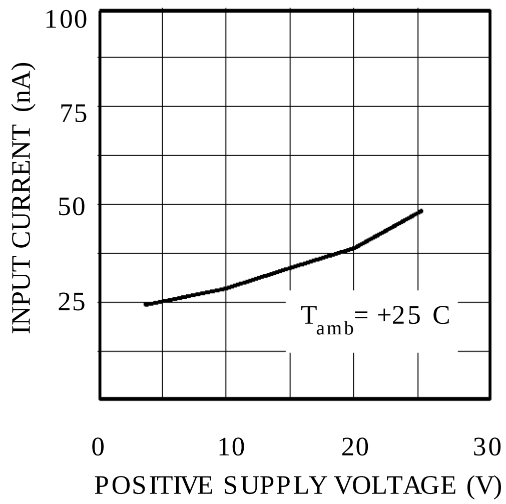
INPUT VOLTAGE RANGE

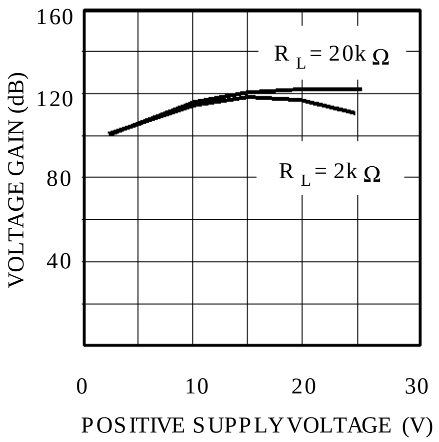


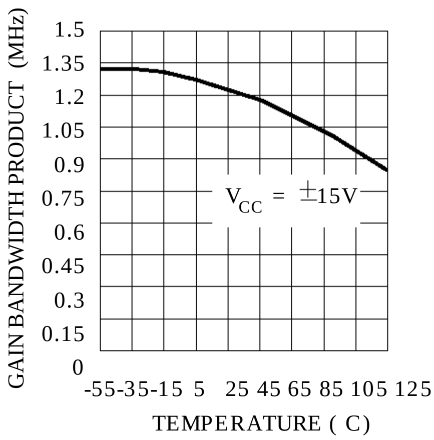
SUPPLY CURRENT

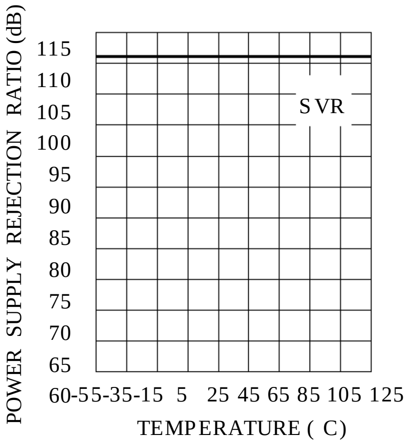


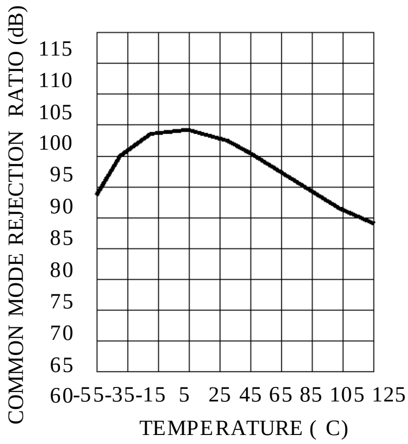






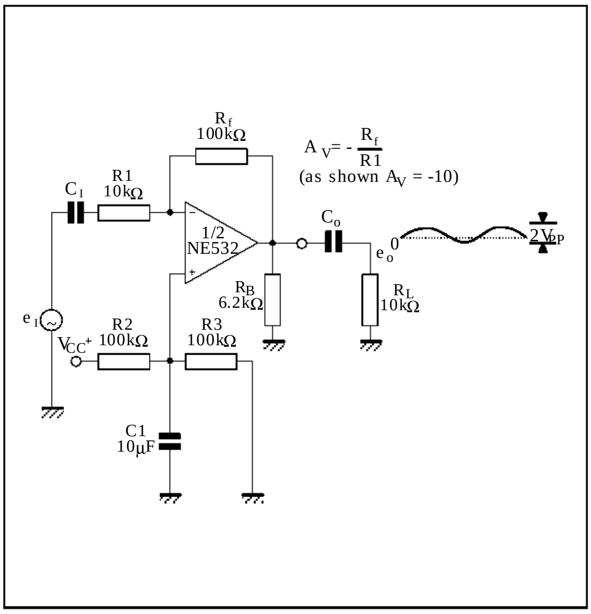




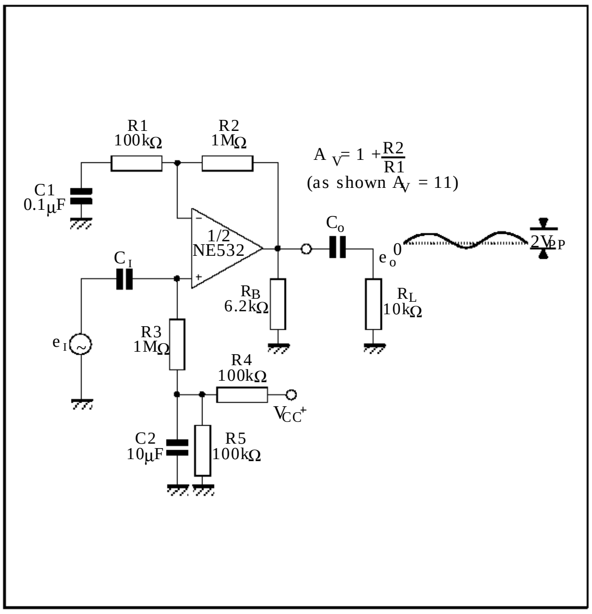


TYPICAL APPLICATIONS (single supply voltage) V_{CC} = +5V_{DC}

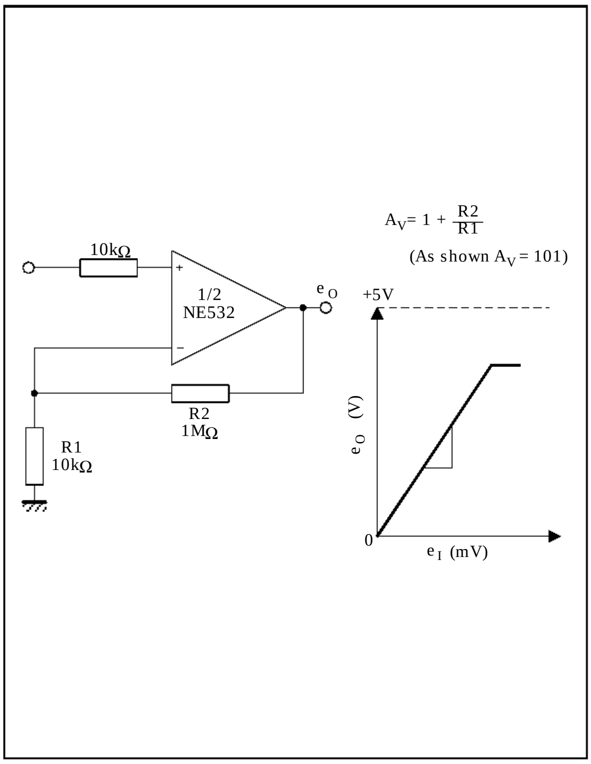
AC COUPLED INVERTING AMPLIFIER



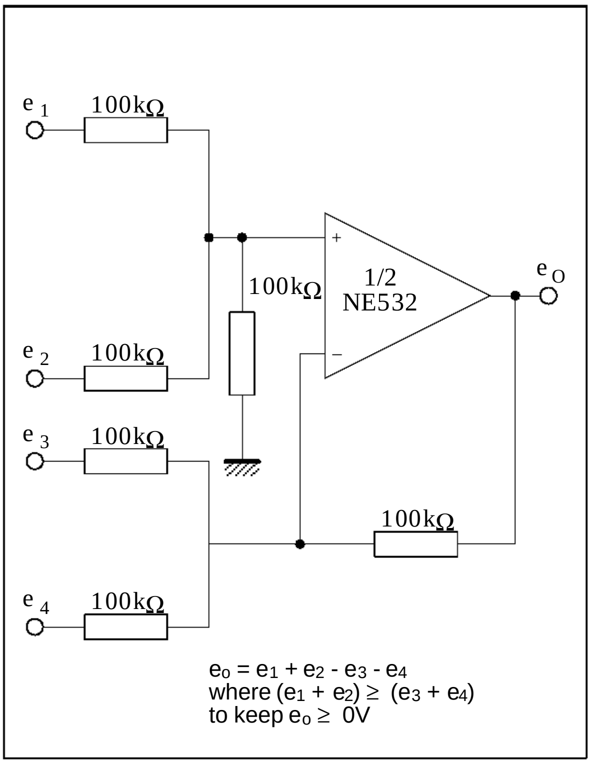
AC COUPLED NON-INVERTING AMPLIFIER



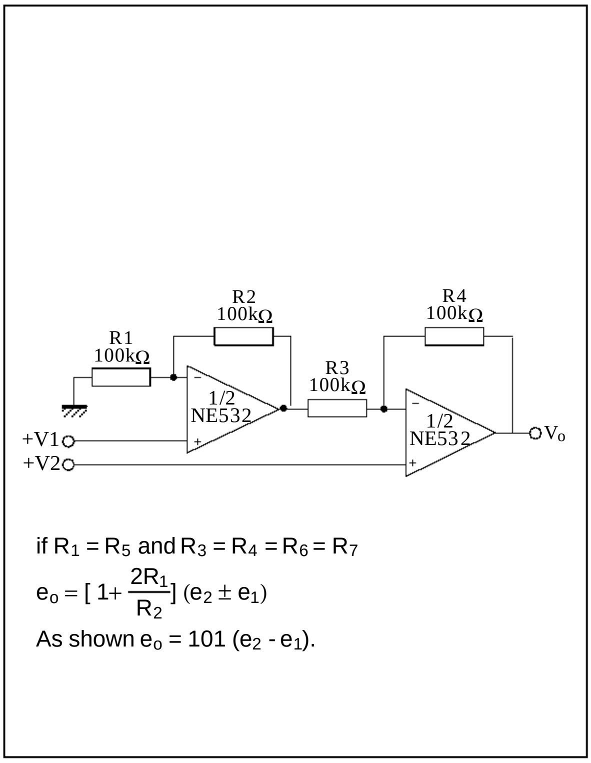
NON-INVERTING DC AMPLIFIER



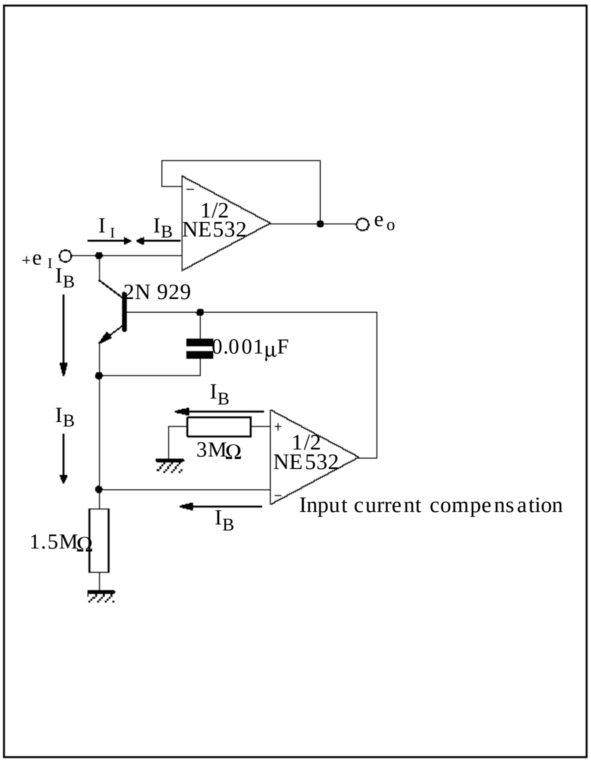
DC SUMMING AMPLIFIER



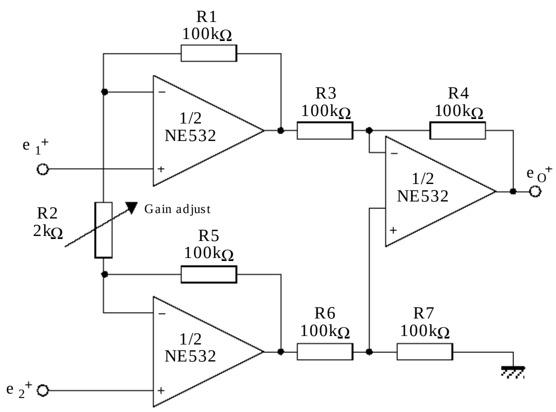
HIGH INPUT Z, DC DIFFERENTIAL AMPLIFIER



USING SYMMETRICAL AMPLIFIERS TO REDUCE INPUT CURRENT



HIGH INPUT Z ADJUSTABLE GAIN DC INSTRUMENTATION AMPLIFIER

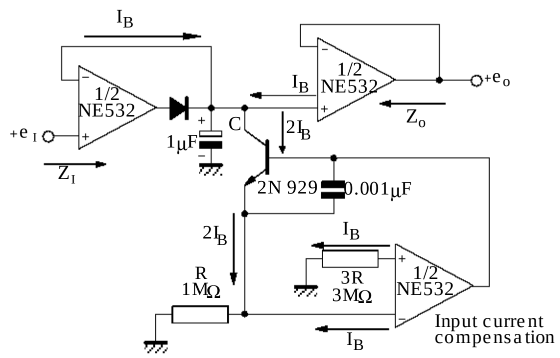


if $R_1 = R_5$ and $R_3 = R_4 = R_6 = R_7$

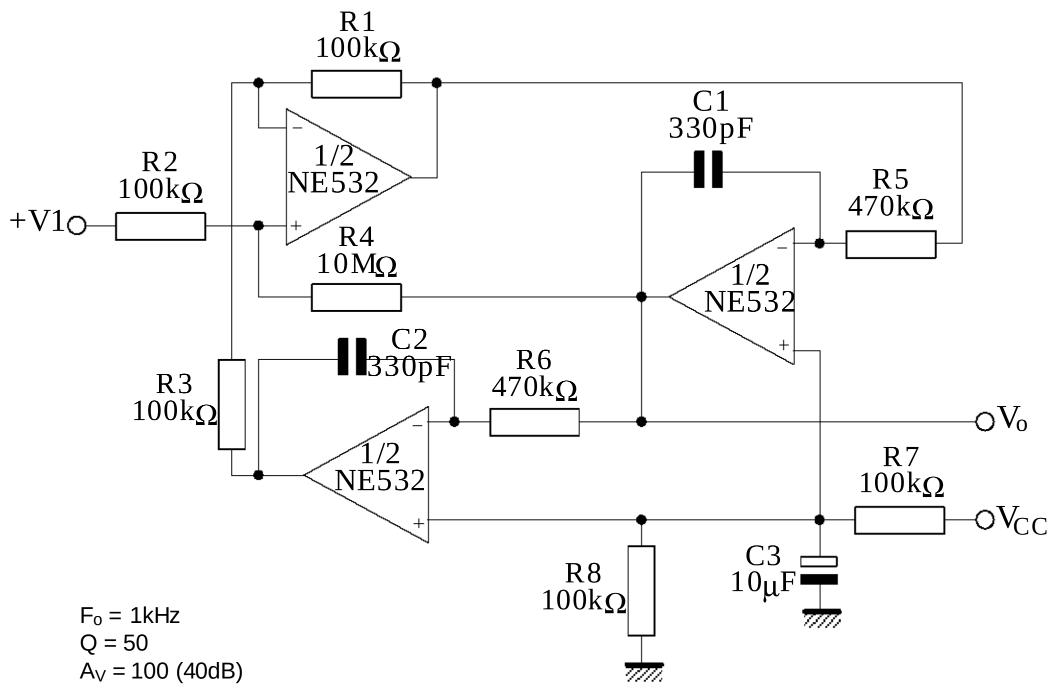
$$e_0 = [1 + \frac{2R_1}{R_2}] (e_2 \pm e_1)$$

As shown $e_0 = 101 (e_2 - e_1)$

LOW DRIFT PEAK DETECTOR



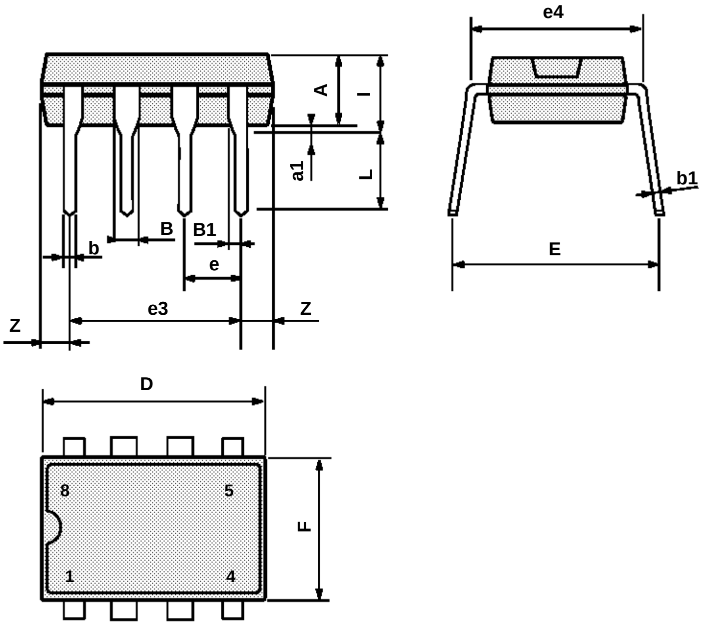
ACTIVE BAND-PASS FILTER



F_0 = 1kHz
Q = 50
A_V = 100 (40dB)

PACKAGE MECHANICAL DATA

8 PINS - PLASTIC DIP OR CERDIP



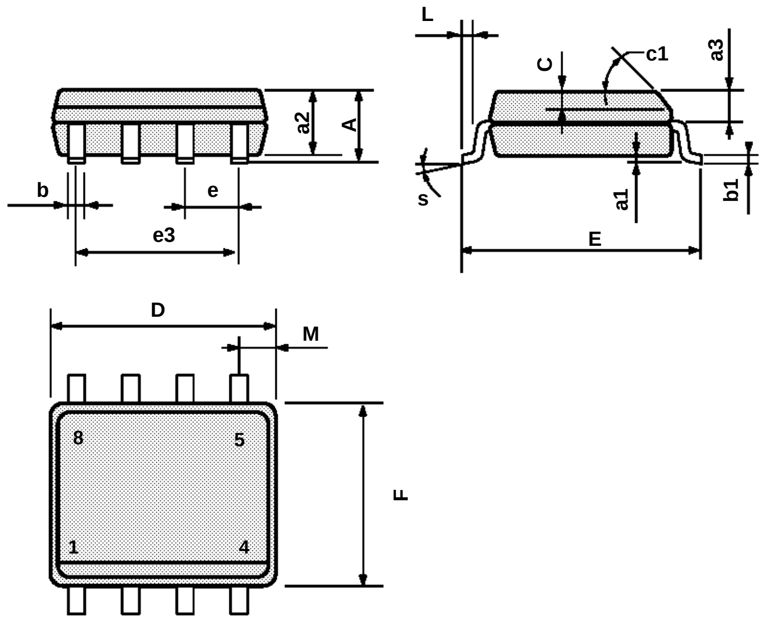
PM-DIP8.EPS

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 :