SGS-THOMSON
MICROELECTRONICS

UA776

PROGRAMMABLE LOW POWER SINGLE OPERATIONAL AMPLIFIERS

- MICROPOWER OPERATION
- NO FREQUENCY COMPENSATION REQUIRED
- WIDE PROGRAMMING RANGE
- HIGH SLEW RATE
- SHORT-CIRCUIT PROTECTION
- PROGRAMMABLE SINGLE OP-AMP

N
DIP8
(Plastic Package)

D
SO8
(Plastic Micropackage)

ORDER CODES

Part Number	Temperature Range	Package	
		N	D
UA776C	0°C, +70°C	•	•
UA776I	-40°C, +105°C	•	•
UA776M	-55°C, +125°C	•	•
Example : UA776CN			

DESCRIPTION

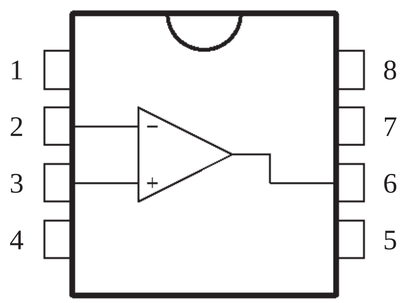
The UA776 programmable operational amplifier is characterized by low supply current and low equivalent input noise voltage over a wide range of operating supply voltages.

Coupled with programmable electrical characteristics, it is a versatile amplifier for use in high accuracy, low power consumption analog applications.

Input noise voltage and current, power consumption and input current can be optimized by a single resistor or current source that sets the chip quiescent current for nano-watt power consumption or for characteristics similar to the UA741.

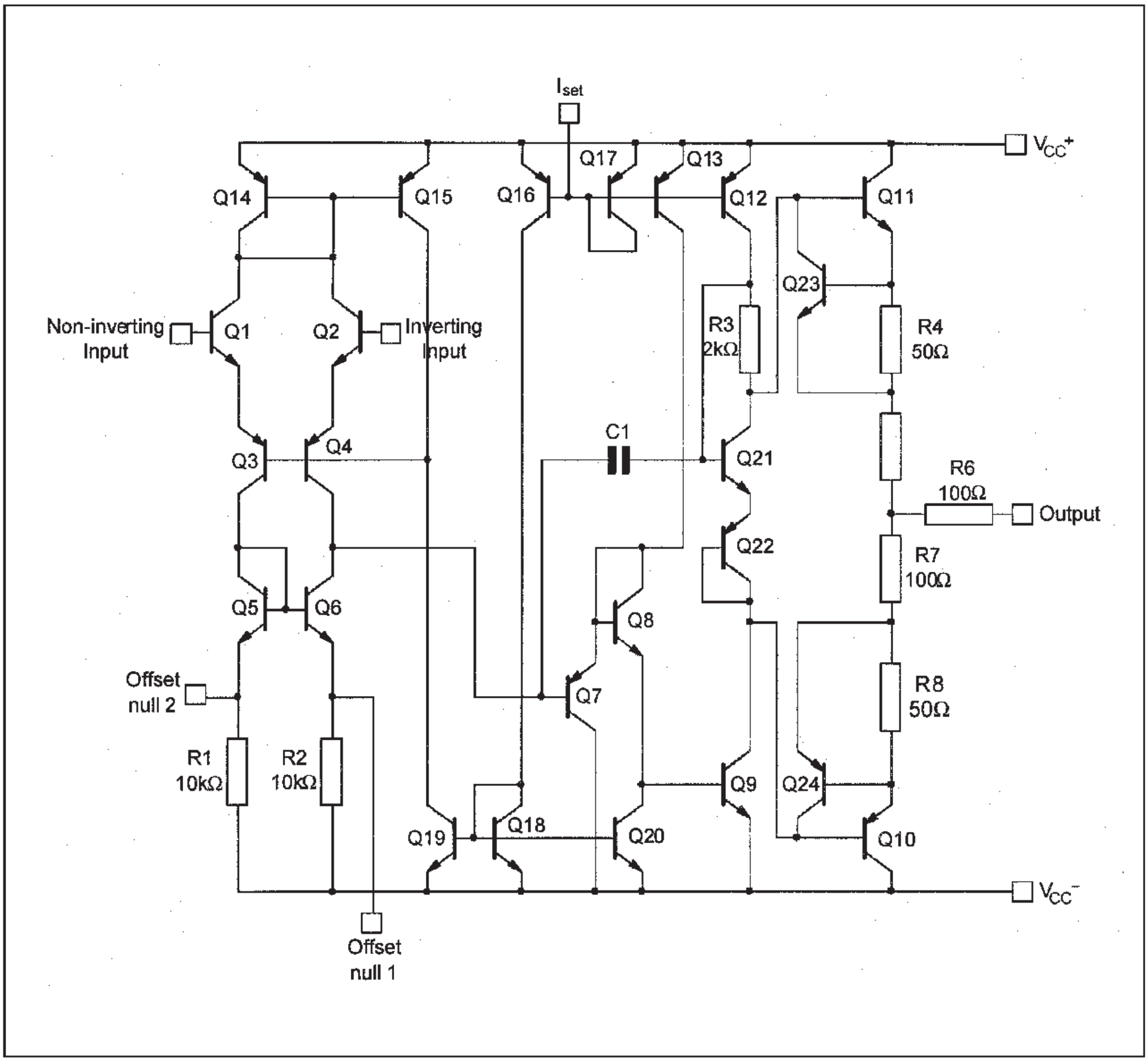
Internal frequency compensation, absence of latch up, high slew rate and short-circuit protection assure ease of use in long time integrators, active filters, and sample and hold circuits.

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 - I_{set}

SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	UA776M	UA776I	UA776C	Unit
V_{cc}	Supply Voltage	±18			V
V_{id}	Differential Input Voltage	±30			V
V_i	Input Voltage - (note 1)	±15			V
P_{tot}	Power Dissipation	500	310	310	mW
	Output Short-circuit Duration	Infinite			
T_{oper}	Operating Free Air Temperature Range	-55 to +125	-40 to +105	0 to +70	^oC
T_{stg}	Storage Temperature Range	-65 to +150	-65 to +150	-65 to +150	^oC

Note : 1. For supply voltages less than ±15V, the absolute maximum input voltage is equal to the supply voltage.

ELECTRICAL CHARACTERISTICS V_{CC} ±15V, T_{amb} = +25°C (unless otherwise specified)

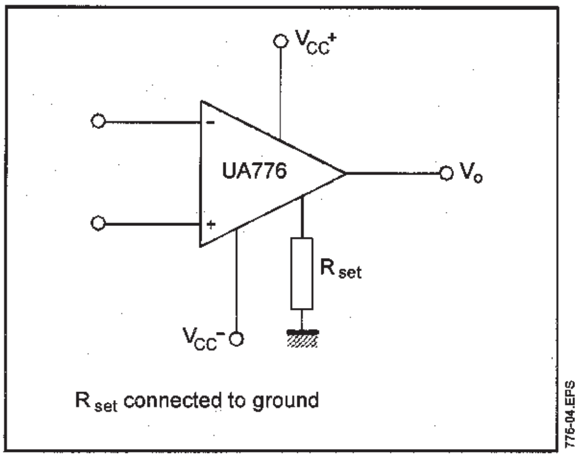
Symbol	Parameter	I_{set} = 1.5µA			I_{set} = 15µA			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	
V_{io}	Input Offset Voltage T_{amb} = +25°C $T_{min.} \leq T_{amb} \leq T_{max.}$		 2	 5 6		 2	 5 6	mV
I_{io}	Input Offset Current T_{amb} = +25°C $T_{min.} \leq T_{amb} \leq T_{max.}$		 0.7	 3 10		 2	 15 40	nA
I_{ib}	Input Bias Current T_{amb} = +25°C UA776M UA776I,C $T_{min.} \leq T_{amb} \leq T_{max.}$		 2 2	 7.5 10 20		 15 15	 50 50 100	nA
A_{vd}	Large Signal Voltage Gain (V_O ±10V) T_{amb} = +25°C R_L = 5kΩ R_L = 75kΩ $T_{min.} \leq T_{amb} \leq T_{max.}$ R_L = 75kΩ R_L = 5kΩ	 200 100	 400		 100 75	 400		V/mV
SVR	Supply Voltage Rejection Ratio ($R_S \leq$ 10kΩ) T_{amb} = +25°C $T_{min.} \leq T_{amb} \leq T_{max.}$	 77 77	 92		 77 77	 92		dB
I_{CC}	Supply Current, no load T_{amb} = +25°C $T_{min.} \leq T_{amb} \leq T_{max.}$		 20	 25 30		 160	 180 200	µA
V_{icm}	Input Common Mode Voltage Range	±10			±10			V
CMR	Common-mode Rejection Ratio ($R_S \leq$ 10kΩ) T_{amb} = +25°C $T_{min.} \leq T_{amb} \leq T_{max.}$	 70 70	 90		 70 70	 90		dB
I_{OS}	Output Short-circuit Current	0.5	3	15	6	12	30	mA
$\pm V_{OPP}$	Output Voltage Swing T_{amb} = +25°C R_L = 5kΩ R_L = 75kΩ $T_{min.} \leq T_{amb} \leq T_{max.}$ R_L = 75kΩ	 12 10	 14		 10 10	 13		V
V_{ior}	Offset Voltage Adjustment Range		9			18		mV
SR	Slew Rate (V_i = ±10V, C_L= 100pF, unity gain) R_L = 5kΩ R_L = 75kΩ	 0.01	 0.1		 0.2	 0.8		V/ms
t_r	Rise Time (V_i = ±20mV, C_L = 100pF, unity gain) R_L = 5kΩ R_L = 75kΩ		 1.6			 0.35		ms
K_{OV}	Overshoot (V_i = ±20mV, CL = 100pF, unity gain) R_L = 5kΩ R_L = 75kΩ		 0			 10		%
R_I	Input Resistance		50			5		MΩ
C_{id}	Differential Input Capacitance		2			2		pF
R_o	Output Resistance		5			1		kΩ
GBP	Gain Bandwidth Product (C_L= 100pF,T_{amb} = 25°C) f = 100kHz R_L = 5kΩ f = 10kHz R_L = 75kΩ	 0.3	 0.1		 0.4	 0.7		MHz
THD	Total Harmonic Distortion (f = 1kHz, A_V = 20dB, V_O = 2V_{PP},C_L = 100pF, T_{amb} = 25°C) R_L = 5kΩ R_L = 75kΩ		 0.8			 0.025		%
en	Equivalent Input Noise Voltage (f = 1kHz, R_s = 100Ω)		 40			 20		$\frac{nV}{\sqrt{Hz}}$

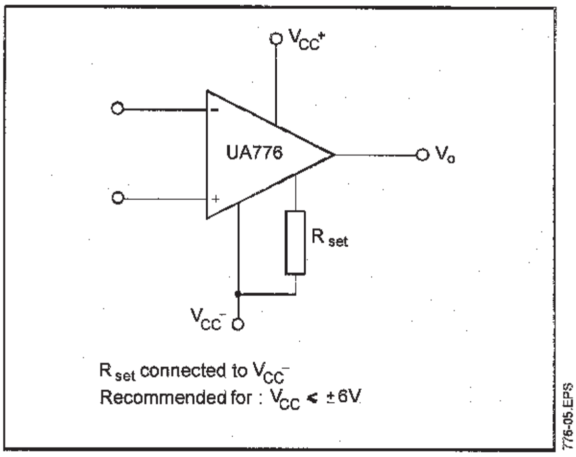
ELECTRICAL CHARACTERISTICS V_{CC} ±3V, T_{amb} = +25°C (unless otherwise specified)

Symbol	Parameter	I_{set} = 1.5µA Min.	Typ.	Max.	I_{set} = 15µA Min.	Typ.	Max.	Unit
V_{io}	Input Offset Voltage T_{amb} = +25°C $T_{min.} \le T_{amb} \le T_{max.}$		2	5 6		2	5 6	mV
I_{io}	Input Offset Current T_{amb} = +25°C $T_{min.} \le T_{amb} \le T_{max.}$		0.7	3 10		2	15 40	nA
I_{ib}	Input Bias Current T_{amb} = +25°C UA776M UA776I,C $T_{min.} \le T_{amb} \le T_{max.}$		2 2	7 10 20		15 15	50 50 100	nA
A_{vd}	Large Signal Voltage Gain (V_O ±10V) T_{amb} = +25°C R_L = 5kΩ R_L = 75kΩ $T_{min.} \le T_{amb} \le T_{max.}$ R_L = 75kΩ R_L = 5kΩ	50 25	200		50 25	200		V/mV
SVR	Supply Voltage Rejection Ratio ($R_S \le$ 10kΩ) T_{amb} = +25°C $T_{min.} \le T_{amb} \le T_{max.}$	77 77	92		77 77	92		dB
I_{CC}	Supply Current, no load T_{amb} = +25°C $T_{min.} \le T_{amb} \le T_{max.}$		13	20 25		130	160 180	µA
V_{icm}	Input Common Mode Voltage Range	±1			±1			V
CMR	Common-mode Rejection Ratio ($R_S \le$ 10kΩ) T_{amb} = +25°C $T_{min.} \le T_{amb} \le T_{max.}$	70 70	90		70 70	90		dB
I_{OS}	Output Short-circuit Current	0.5	3	15	2	5	20	mA
$\pm V_{OPP}$	Output Voltage Swing T_{amb} = +25°C R_L = 75kΩ R_L = 5kΩ $T_{min.} \le T_{amb} \le T_{max.}$ R_L = 75kΩ R_L = 5kΩ	2 2	2.4		2 1.9 2 1.9	2.4 2.1		V
V_{ior}	Offset Voltage Adjustment Range		9			18		mV
SR	Slew Rate (V_i = ±10V, C_L= 100pF, unity gain) R_L = 5kΩ R_L = 75kΩ		0.03			0.35		V/ms
t_r	Rise Time (V_i = ±20mV, C_L = 100pF, unity gain) R_L = 5kΩ R_L = 75kΩ		3			0.6		µs
K_{OV}	Overshoot (V_i = ±20mV, CL = 100pF, unity gain) R_L = 5kΩ R_L = 75kΩ		0			5		%
R_I	Input Resistance		50			5		MΩ
C_{id}	Differential Input Capacitance		2			2		pF
R_o	Output Resistance		5			1		kΩ
GBP	Gain Bandwidth Product (C_L= 100pF,T_{amb} = 25°C) f = 100kHz R_L = 5kΩ f = 10kHz R_L = 75kΩ		0.075			0.5		MHz
THD	Total Harmonic Distortion (f = 1kHz, A_V = 20dB, V_O = $2V_{PP}$,C_L = 100pF, T_{amb} = 25°C) R_L = 5kΩ R_L = 75kΩ		1			0.03		%
en	Equivalent Input Noise Voltage (f = 1kHz, R_s = 100Ω)		20			20		$\frac{nV}{\sqrt{Hz}}$

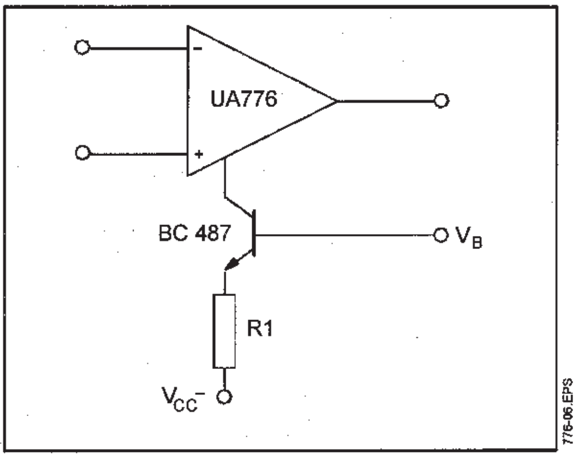
BIASING CIRCUITS

RESISTOR BIASING

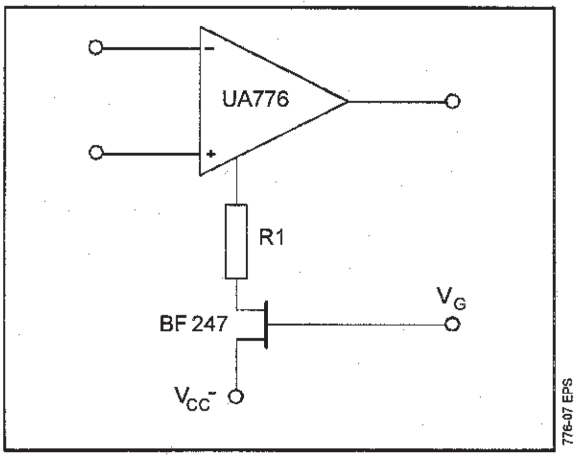




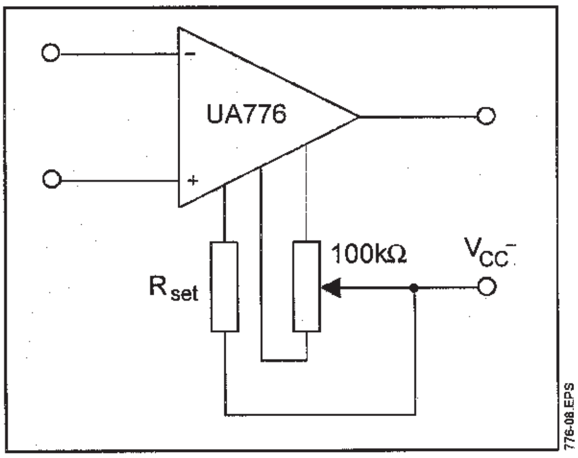
TRANSISTOR CURRENT SOURCE BIASING



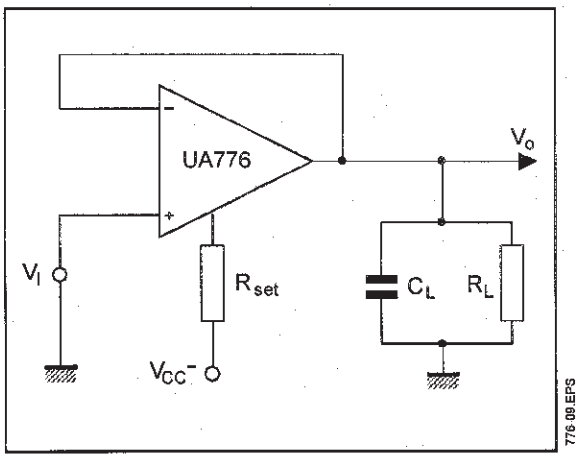
FET CURRENT SOURCE BIASING



OFFSET VOLTAGE NULL CIRCUIT

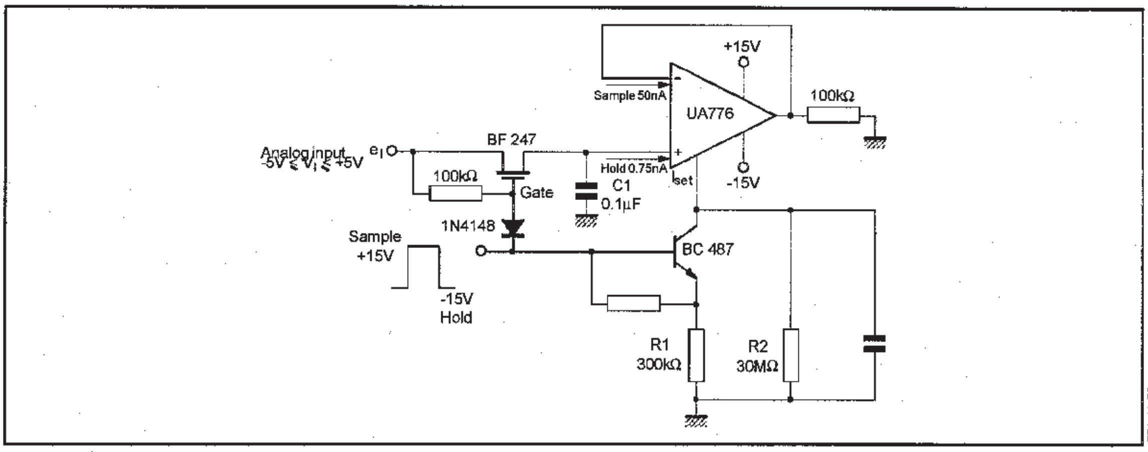


TRANSIENT RESPONSE TIME TEST CIRCUIT

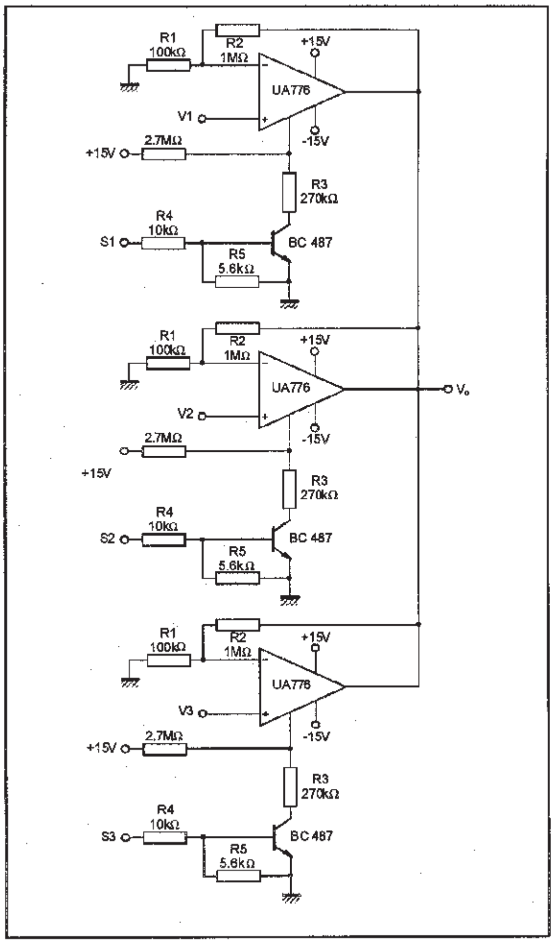


TYPICAL APPLICATIONS

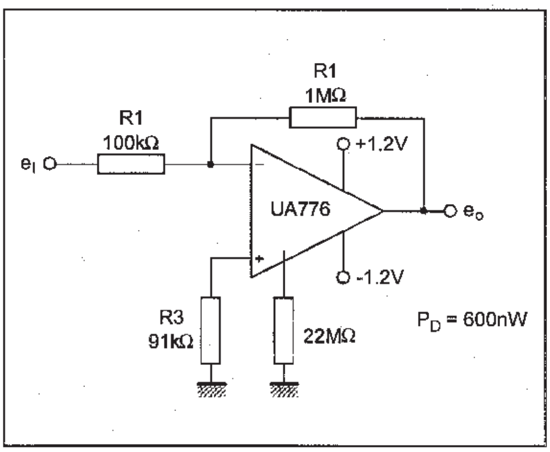
HIGH ACCURACY SAMPLE AND HOLD



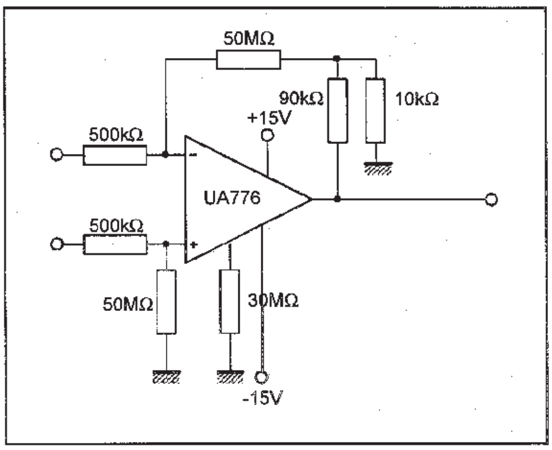
MULTIPLEXING AND SIGNAL CONDITIONING WITHOUT FETs



NANO-WATT AMPLIFIER

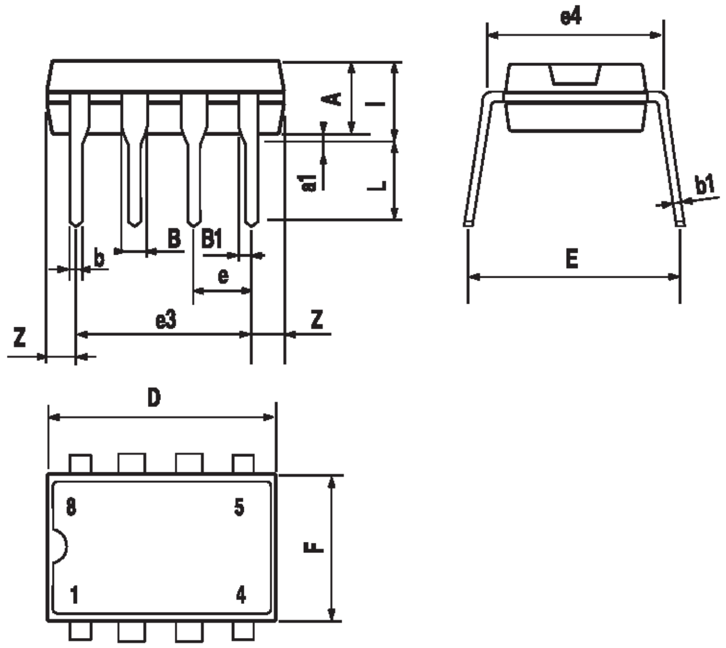


HIGH INPUT IMPEDANCE AMPLIFIER



PACKAGE MECHANICAL DATA

8 PINS - PLASTIC DIP

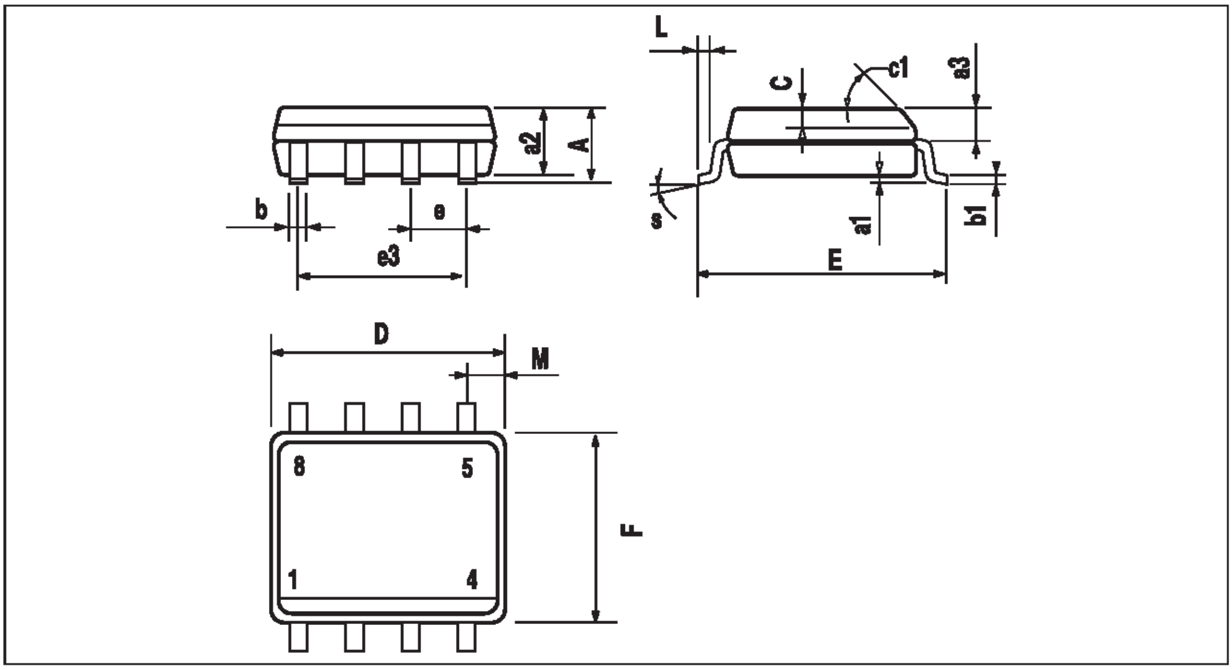


Dim.	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A		3.32			0.131	
a1	0.51			0.020		
B	1.15		1.65	0.045		0.065
b	0.356		0.55	0.014		0.022
b1	0.204		0.304	0.008		0.012
D			10.92			0.430
E	7.95		9.75	0.313		0.384
e		2.54			0.100	
e3		7.62			0.300	
e4		7.62			0.300	
F			6.6			0260
i			5.08			0.200
L	3.18		3.81	0.125		0.150
Z			1.52			0.060

1

PACKAGE MECHANICAL DATA

8 PINS - PLASTIC MICROPACKAGE (SO)



Dim.	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.)					

1

SGS-THOMSON Microelectronics GROUP OF COMPANIES
Australia - Brazil - Canada - China - France - Germany - Italy - Japan - Korea - Malaysia - Malta - Morocco The Netherlands - Singapore - Spain - Sweden - Switzerland - Taiwan - Thailand - United Kingdom - U.S.A.