# SGS-THOMSON MICROELECTRONICS

UA748

PRECISION SINGLE OPERATIONAL AMPLIFIER

- INPUT OFFSET VOLTAGE : 3mV max. OVER TEMPERATURE
- FREQUENCY COMPENSATION WITH A SINGLE 30pF CAPACITOR (C1)
- OPERATION FROM ±5V to ±15V
- LOW POWER CONSUMPTION : 50mW AT ±15V
- CONTINUOUS SHORT-CIRCUIT PROTECTION
- OPERATION AS A COMPARATOR WITH DIFFERENTIAL INPUTS AS HIGH AS ±30V
- NO LATCH-UP WHEN COMMON-MODE RANGE IS EXCEEDED
- SAME PIN CONFIGURATION AS THE LM101A

N
DIP8
(Plastic Package)

D
SO8
(Plastic Micropackage)
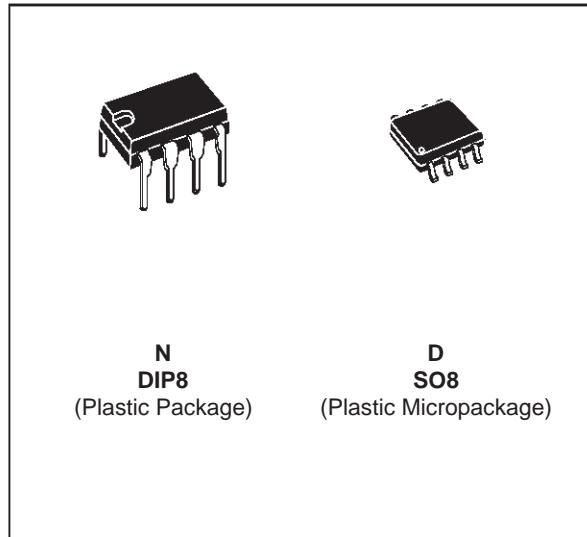
ORDER CODES

| Part Number	Temperature Range	Package	
		N	D
UA748C	0°C, +70°C	•	•
UA748I	-40°C, +105°C	•	•
UA748M	-55°C, +125°C	•	•
Example : UA748CN			

DESCRIPTION

The UA748 is a general purpose operational amplifier built on a single silicon chip. The resulting close match and tight thermal coupling gives low offsets and temperature drift as well as fast recovery from thermal transients.

- Short-circuit protection
- Offset voltage null capability
- Large common-mode and differential voltage ranges
- Low power consumption
- No latch-up

The unity-gain compensation specified makes the circuit stable for all feedback configurations, even with capacitive loads. However, it is possible to optimize compensation for best high frequency performance at any gain. The low power dissipation permits high voltage operation and simplifies packaging in full-temperature range systems.

PIN CONNECTIONS (top view)

1 - Offset null 1 / frequency compensation
2 - Inverting input
3 - Non-inverting input
4 - V_{CC}^-
5 - Offset null 2
6 - Output
7 - V_{CC}^+
8 - Frequency compensation
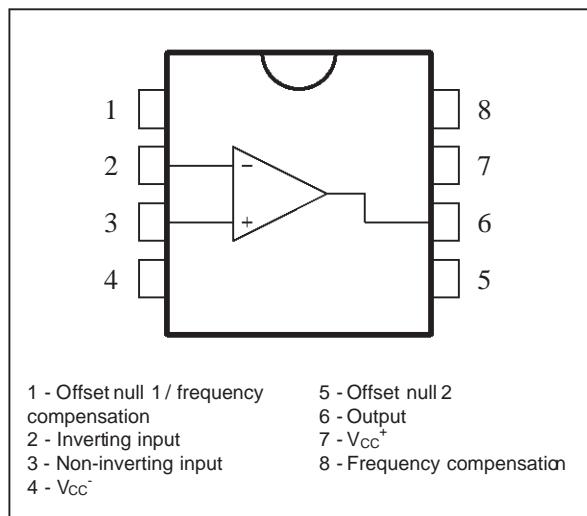
SCHEMATIC DIAGRAM
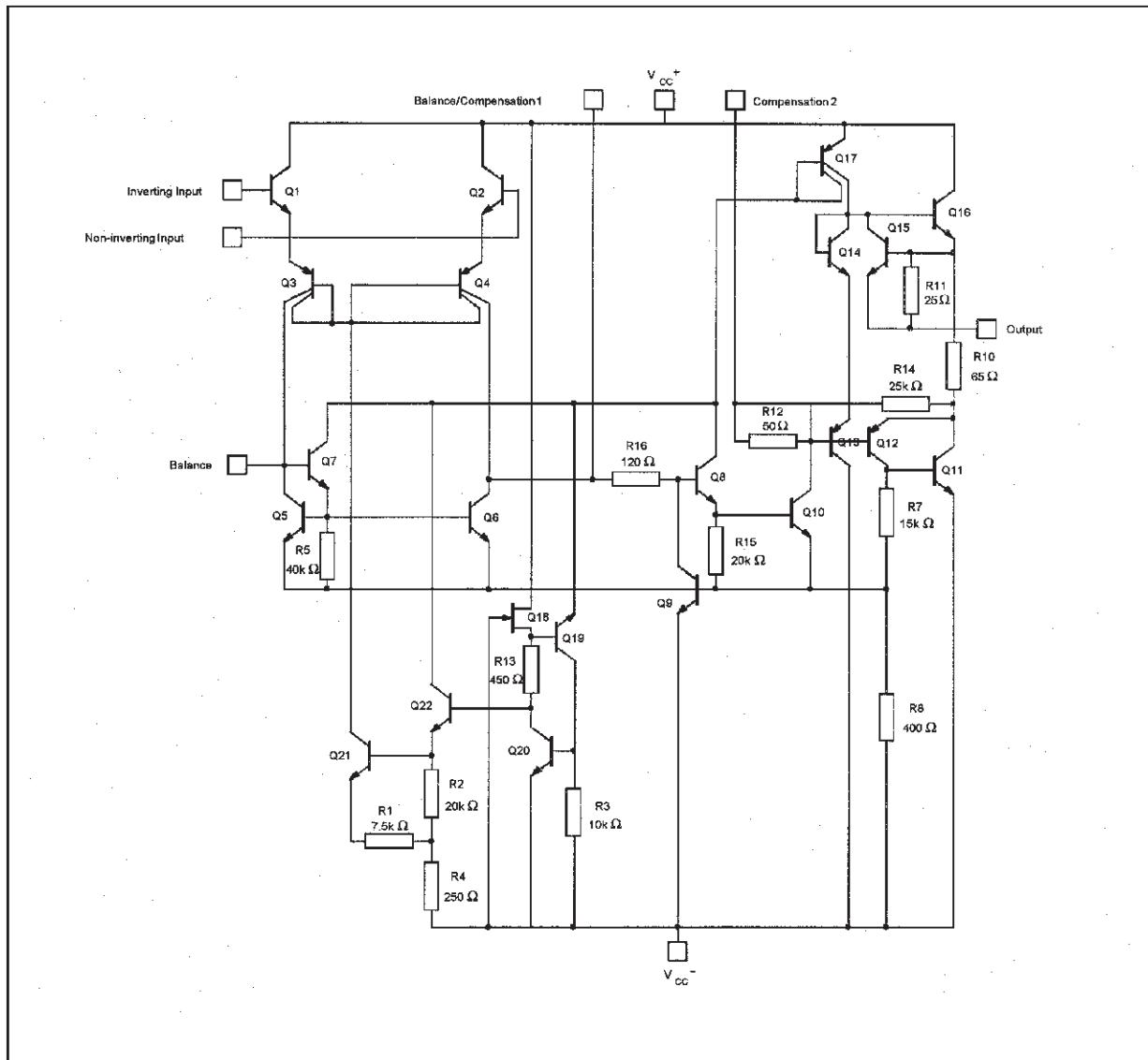
ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	UA748M	UA748I	UA748C	Unit
V_{cc}	Supply Voltage		±22		V
V_{id}	Differential Input Voltage		±30		V
V_i	Input Voltage		±15		V
P_{tot}	Power Dissipation		500		mW
	Output Short-circuit Duration		Infinite		
T_{oper}	Operating Free Air Temperature Range	-55 to +125	-40 to +105	0 to +70	^{o}C
T_{stg}	Storage Temperature Range	-65 to +150	-65 to +150	-65 to +150	^{o}C

## ELECTRICAL CHARACTERISTICS

$\pm 5V \le V_{CC} \le \pm 20V$, $C1 = 30pF$, $T_{amb} = +25^oC$ (unless otherwise specified)

| Symbol	Parameter	UA748I/M			UA748C			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	
V_{io}	Input Offset Voltage ($R_S \le 10k\Omega$) $T_{amb} = +25^oC$ $T_{min.} \le T_{amb} \le T_{max.}$		0.2	2 3		2	7.5 10	mV
I_{io}	Input Offset Current $T_{amb} = +25^oC$ $T_{min.} \le T_{amb} \le T_{max.}$		25	75 10		70	250 300	nA
I_{ib}	Input Bias Current $T_{amb} = +25^oC$ $T_{min.} \le T_{amb} \le T_{max.}$		1.5	10 20		2	50 70	nA
A_{vd}	Large Signal Voltage Gain * ($V_{CC} = \pm 15V$, $V_O \pm 10V$, $R_L = 2k\Omega$) $T_{amb} = +25^oC$ $T_{min.} \le T_{amb} \le T_{max.}$	50 25	100		25 15	10		V/mV
SVR	Supply Voltage Rejection Ratio ($R_S \le 10k\Omega$) $T_{amb} = +25^oC$ $T_{min.} \le T_{amb} \le T_{max.}$	80 80	96		70 70	96		dB
I_{CC}	Supply Current, no load $T_{amb} = +25^oC$ $T_{min.} \le T_{amb} \le T_{max.}$		1.8	3 3		1.8	3 3	mA
V_{icm}	Input Common Mode Voltage Range ($V_{CC} = \pm 20V$) $T_{amb} = +25^oC$ $T_{min.} \le T_{amb} \le T_{max.}$	± 15 ± 15			± 15 ± 15			V
CMR	Common-mode Rejection Ratio ($R_S \le 10k\Omega$) $T_{amb} = +25^oC$ $T_{min.} \le T_{amb} \le T_{max.}$	80 80	96		70 70	96		dB
I_{OS}	Output Short-circuit Current ($V_{CC} = \pm 15V$)	10	30	50	10	30	50	mA
$\pm V_{OPP}$	Output Voltage Swing ($V_{CC} = \pm 15V$) $T_{amb} = +25^oC$ $R_L = 10k\Omega$ $R_L = 2k\Omega$ $T_{min.} \le T_{amb} \le T_{max.}$ $R_L = 10k\Omega$ $R_L = 2k\Omega$	12 10 12 10	14 13		12 10 12 10	14 13		V
SR	Slew Rate ($V_i = \pm 10V$, $R_L = 2k\Omega$, $C_L = 100pF$, unity gain)	0.25	0.5		0.25	0.5		V/μs
t_r	Rise Time ($V_i = \pm 20mV$, $R_L = 2k\Omega$, $C_L = 100pF$, unity gain)		0.3			0.3		μs
K_{OV}	Overshoot ($V_i = 20mV$, $R_L = 2k\Omega$, $C_L = 100pF$, unity gain)		5			5		%
Z_I	Input Impedance ($V_{CC} = \pm 15V$)	1.5	4		1.5	4		MΩ
R_o	Output Resistance ($V_{CC} = \pm 15V$)		75			75		Ω
GBP	Gain Bandwidth Product ($V_i = 10mV$, $R_L = 2k\Omega$, $C_L = 100pF$, $f = 100kHz$)	0.5	1		0.5	1		MHz
THD	Total Harmonic Distortion ($f = 1kHz$, $A_V = 20dB$, $R_L = 2k\Omega$, $V_O = 2V_{PP}$, $C_L = 100pF$)		0.015			0.015		%
DV_{io}	Input Offset Current Drift $25^oC \le T_{amb} \le T_{max.}$ $T_{min.} \le T_{amb} \le T_{max.}$		10 20	100 200		10 20	300 600	pA/^oC
DI_{io}	Input Offset Voltage Drift $T_{min.} \le T_{amb} \le T_{max.}$		3	15		6	30	μV/^oC

CURRENT LIMITING
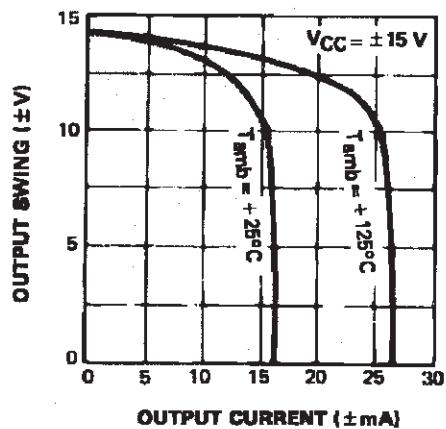
INPUT CURRENT
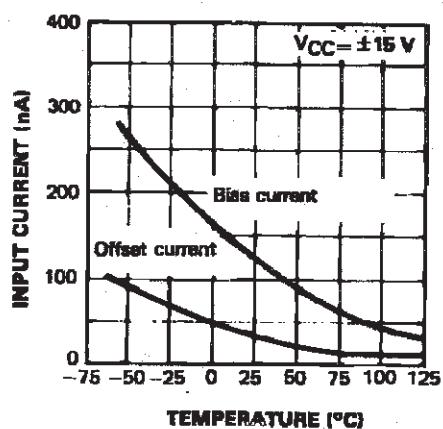
**OPEN LOOP FREQUENCY RESPONSE**
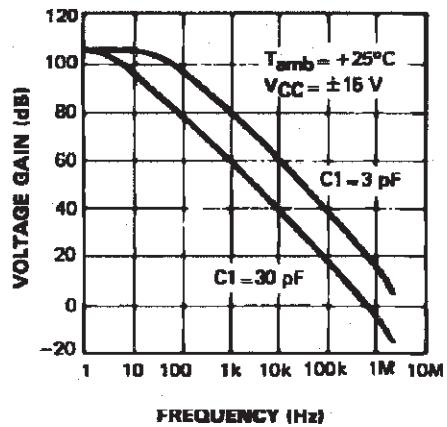
LARGE SIGNAL FREQUENCY RESPONSE
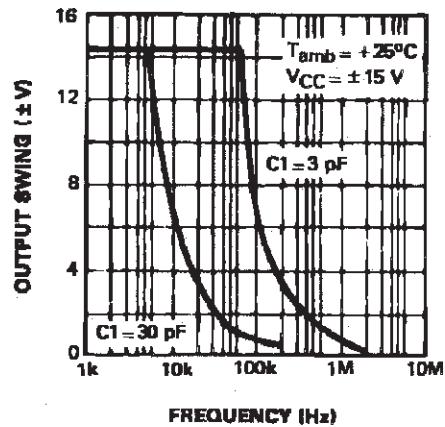
FREQUENCY COMPENSATION
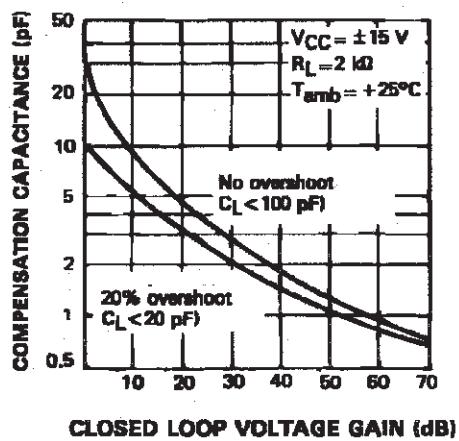

VOLTAGE FOLLOWER PULSE RESPONSE

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INPUT VOLTAGE RANGE

OUTPUT SWING

VOLTAGE GAIN

SUPPLY CURRENT

VOLTAGE GAIN

INPUT BIAS CURRENT

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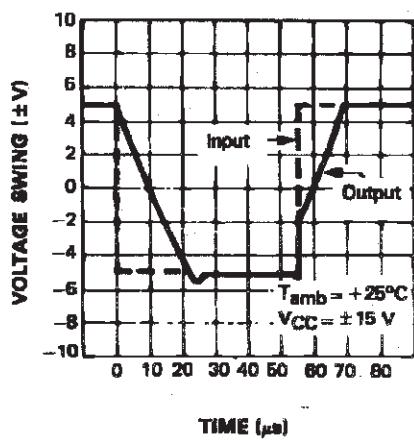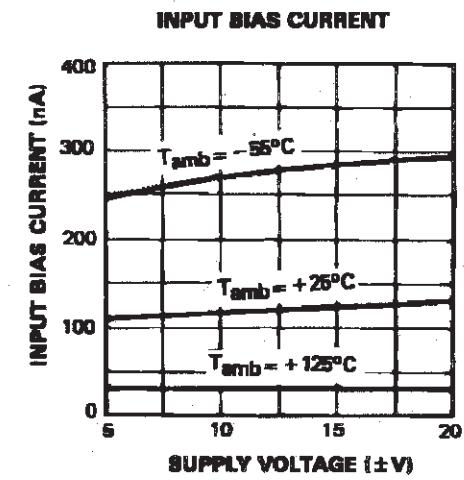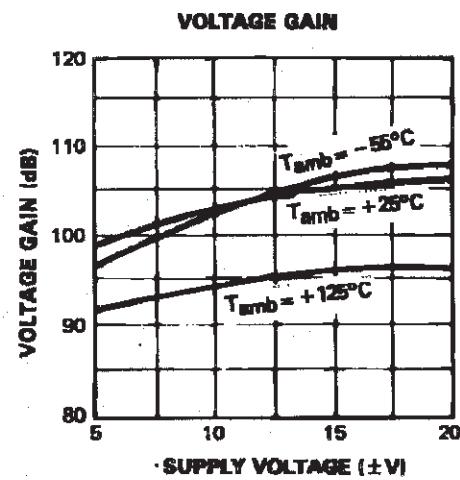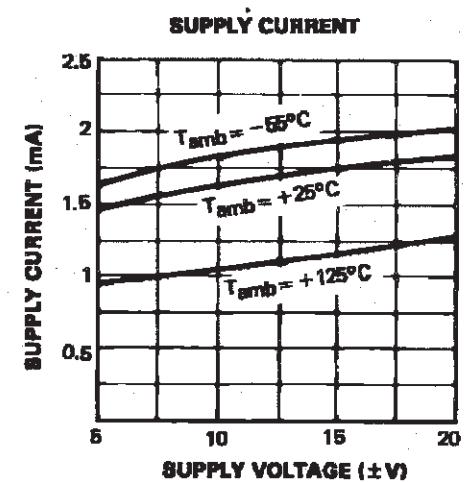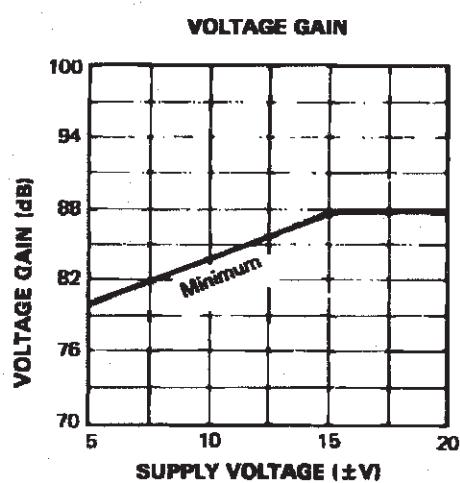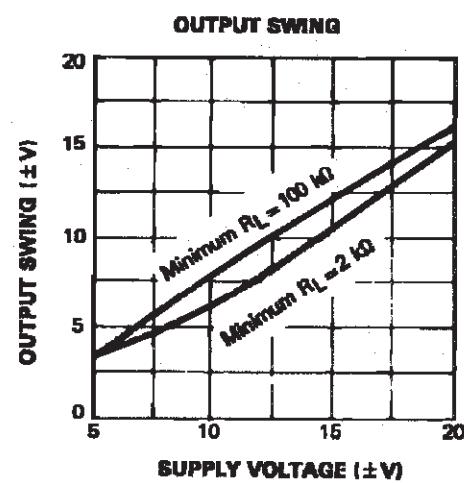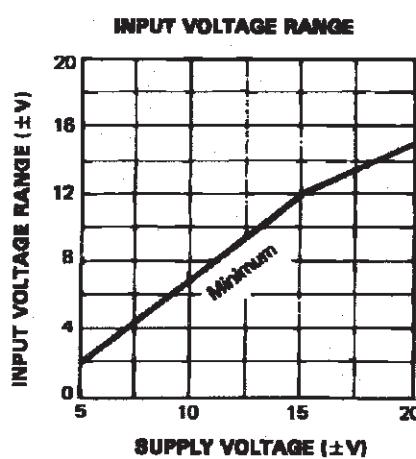
TYPICAL APPLICATIONS

PRACTICAL DIFFERENTIATOR

748-16.EPS
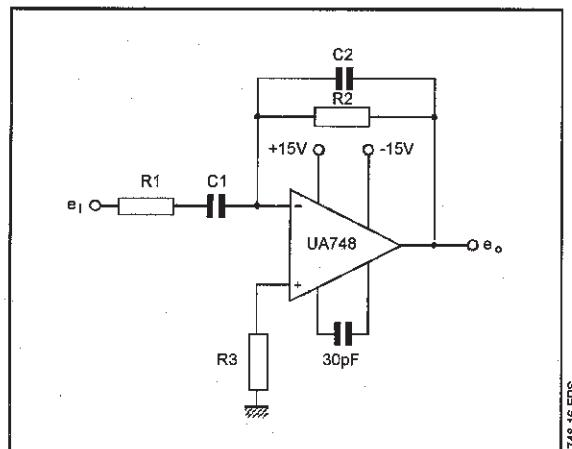
SINGLE SUPPLY OPERATION
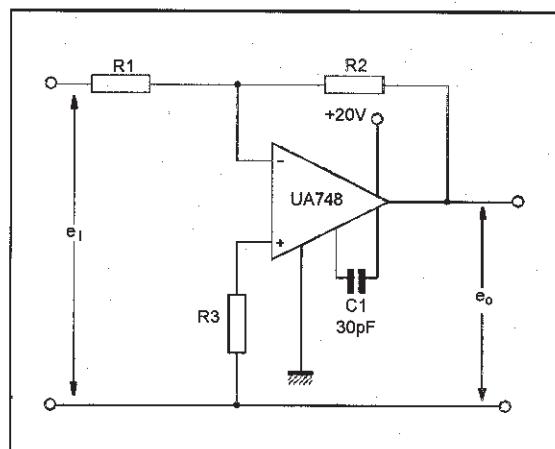
748-17.EPS

PULSE WIDTH MODULATOR

$$f_c = \frac{1}{2\pi \, R2 \, C1}$$

$$f_n = \frac{1}{2\pi \, R1 \, C1}$$

$f_c < f_n$ (unity gain)

748-18.EPS
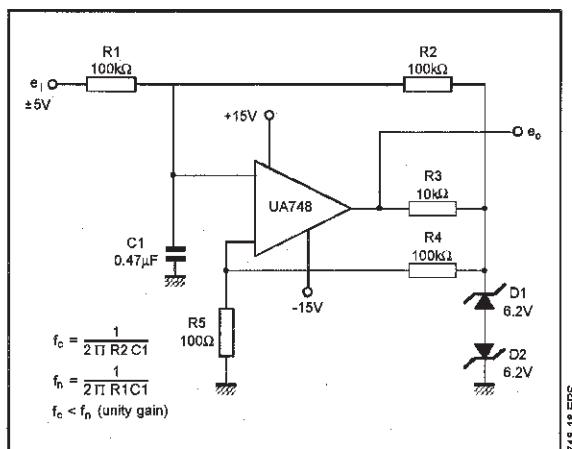
FEED-FORWARD COMPENSATION
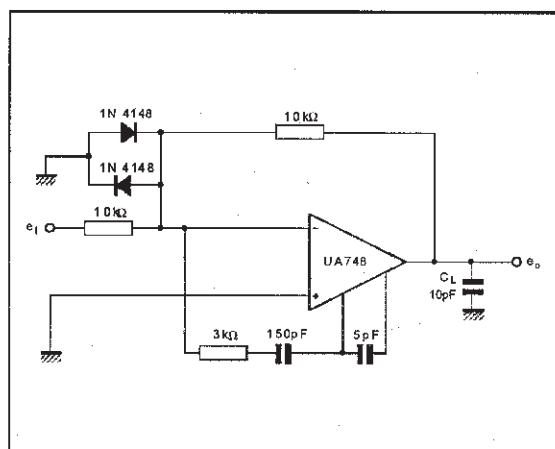
748-19.EPS

LARGE SIGNAL FEED-FORWARD TRANSIENT RESPONSE

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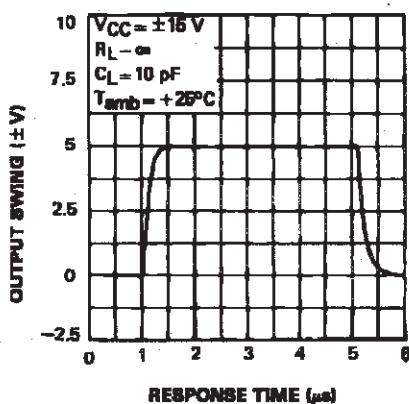
PACKAGE MECHANICAL DATA
8 PINS - PLASTIC DIP
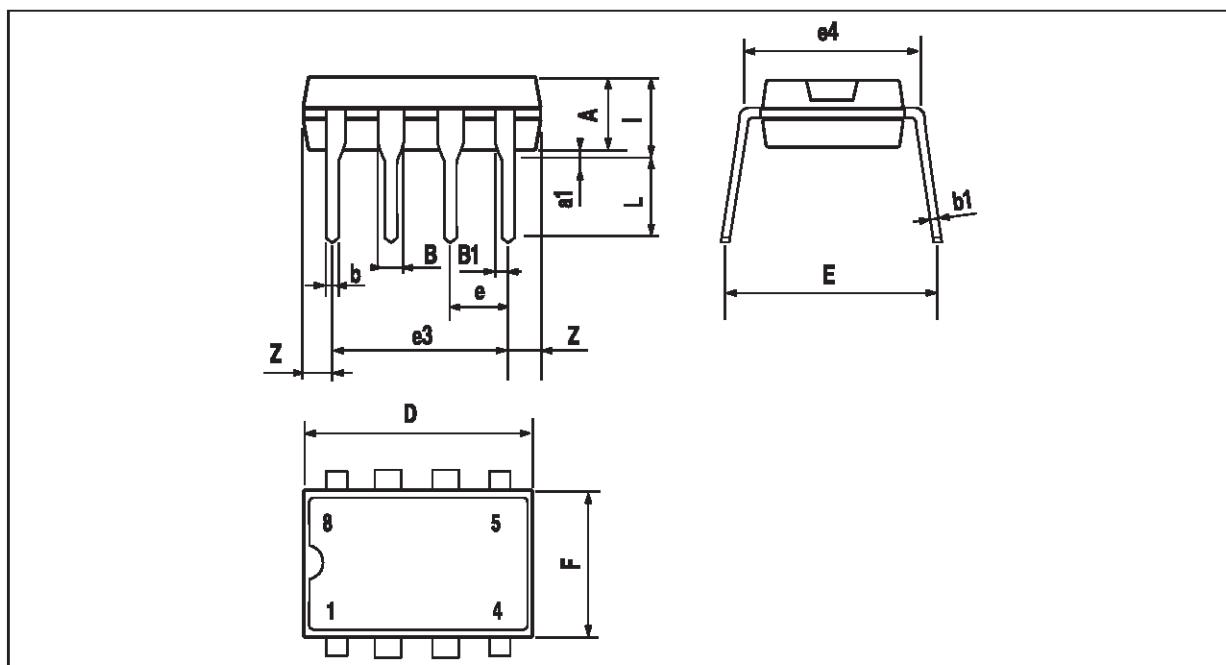
Dim.	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A		3.32			0.131	
a1	0.51			0.020		
B	1.15		1.65	0.045		0.065
b	0.356		0.55	0.014		0.022
b1	0.204		0.304	0.008		0.012
D			10.92			0.430
E	7.95		9.75	0.313		0.384
e		2.54			0.100	
e3		7.62			0.300	
e4		7.62			0.300	
F			6.6			0260
i			5.08			0.200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

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PACKAGE MECHANICAL DATA
8 PINS - PLASTIC MICROPACKAGE (SO)
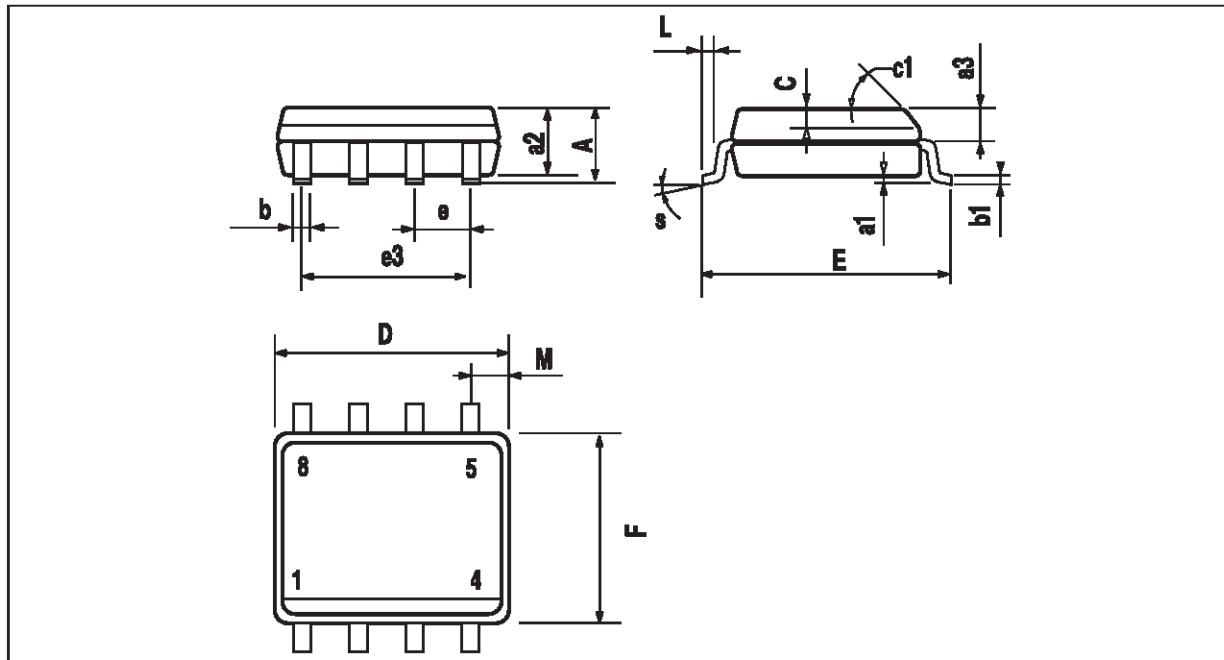
Dim.	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			1.75			0.069
a1	0.1		0.25	0.004		0.010
a2			1.65			0.065
a3	0.65		0.85	0.026		0.033
b	0.35		0.48	0.014		0.019
b1	0.19		0.25	0.007		0.010
C	0.25		0.5	0.010		0.020
c1	45° (typ.)					
D	4.8		5.0	0.189		0.197
E	5.8		6.2	0.228		0.244
e		1.27			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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