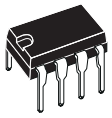
TS512,A

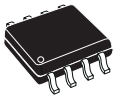
PRECISION DUAL OPERATIONAL AMPLIFIER

- LOW INPUT OFFSET VOLTAGE: 500µV max.
- LOW POWER CONSUMPTION
- SHORT CIRCUIT PROTECTION
- LOW DISTORTION, LOW NOISE
- HIGH GAIN-BANDWIDTH PRODUCT: 3MHz
- HIGH CHANNEL SEPARATION
- ESD INTERNAL PROTECTION
- LOW INPUT OFFSER CURRENT

- **MACROMODEL** INCLUDED IN THIS SPECIFICATION



N
DIP8
(Plastic Package)



D
SO8
(Plastic Micropackage)

DESCRIPTION

The TS512 is a high performance dual operational amplifier with frequency and phase compensation built into the chip. The internal phase compensation allows stable operation as voltage follower in spite of its high gain-bandwidth products.

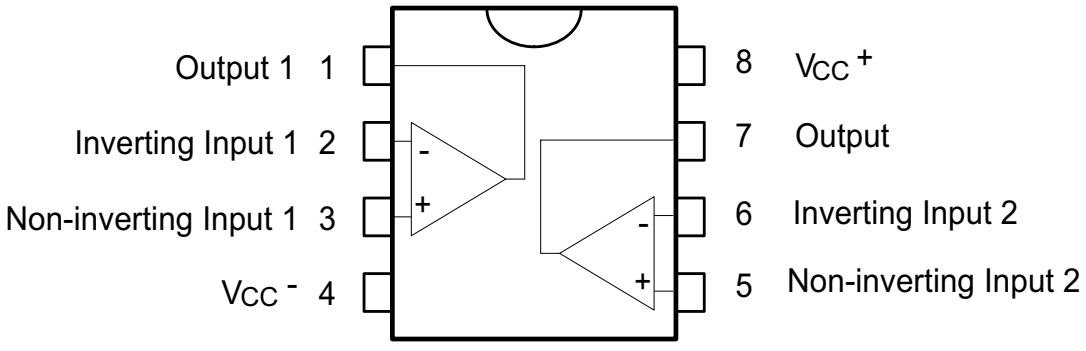
The circuit presents very stable electrical characteristics over the entire supply voltage range, and is particularly intended for professional and telecom applications (active filter, etc).

ORDER CODE

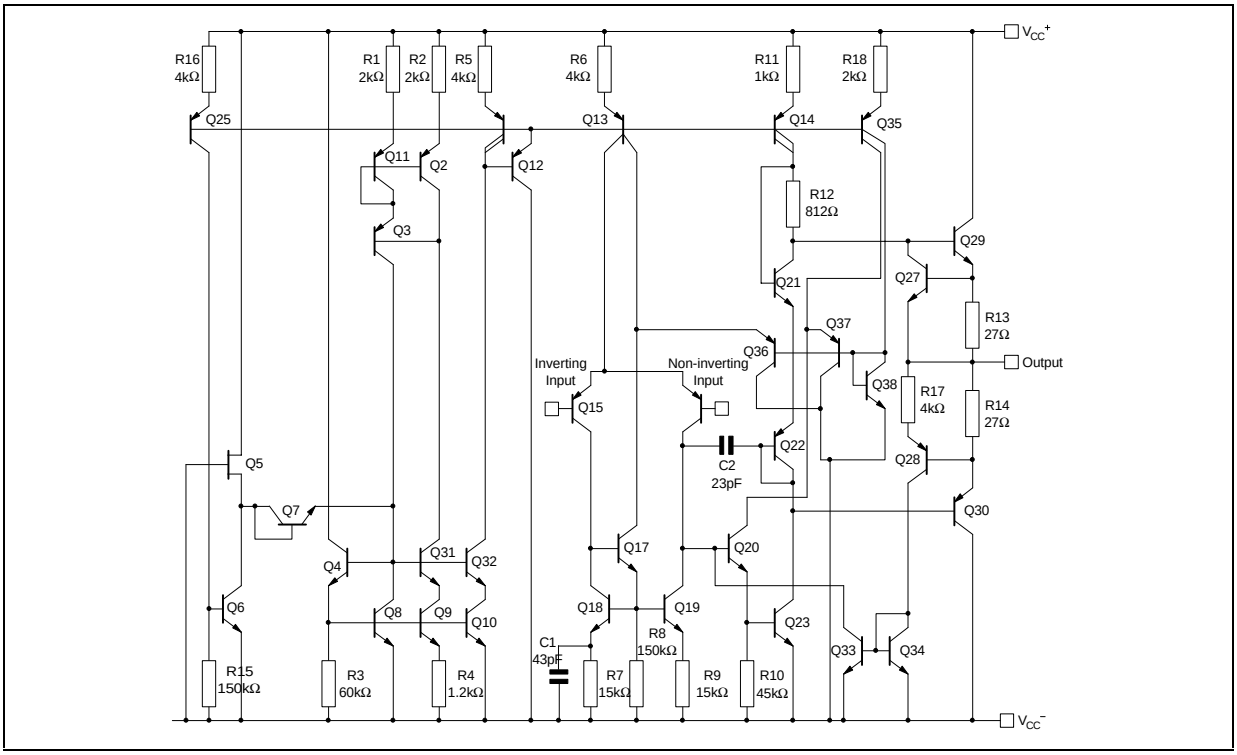
Part Number	Temperature Range	Package	
		N	D
TS512I	-40°C, +125°C	•	•
TS512AI	-40°C, +125°C	•	•

N = Dual in Line Package (DIP)
D = Small Outline Package (SO) - also available in Tape & Reel (DT)

PIN CONNECTIONS (top view)



SCHEMATIC DIAGRAM (1/2 TS512)



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CC}	Supply Voltage	±18	V
V_i	Input Voltage	$\pm V_{CC}$	
V_{id}	Differential Input Voltage	$\pm(V_{CC} - 1)$	
T_{oper}	Operating Free-Air Temperature Range	-40 to +125	°C
p_{tot}	Power Dissipation at T_{amb} = 70°C 1)	500	mW
T_j	Junction Temperature	+ 150	°C
T_{stg}	Storage Temperature Range	-65 to +150	°C

1. Power dissipation must be considered to ensure maximum junction temperature (Tj) is not exceeded.

ELECTRICAL CHARACTERISTICS

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

Symbol	Parameter	Min.	Typ.	Max.	Unit
I_{cc}	Supply Current		0.7	1.2	mA
I_{ib}	Input Bias Current $T_{min} \le T_{op} \le T_{max}$		50	150 300	nA
R_i	Input Resistance, f = 1kHz		1		MΩ
V_{io}	Input Offset Voltage TS512 TS512A $T_{min} \le T_{op} \le T_{max}$ TS512 TS512A		0.5	2.5 0.5 3.5 1.5	mv
ΔV_{io}	Input Offset Voltage Drift $T_{min} \le T_{op} \le T_{max}$		2		µV/°C
I_{io}	Input Offset Current $T_{min} \le T_{op} \le T_{max}$		5	20 40	nA
ΔI_{io}	Input Offset Current Drift $T_{min} \le T_{op} \le T_{max}$		0.08		$\frac{nA}{°C}$
I_{os}	Output Short Circuit Current		23		mA
A_{vd}	Large Signal Voltage Gain R_L = 2kΩ V_{cc} = ±15V V_{cc} = ± 4V	90	100 95		dB
GBP	Gain-bandwidth Product, f = 100kHz	1.8	3		MHz
e_n	Equivalent Input Noise Voltage, f = 1kHz Rs = 50Ω Rs = 1kΩ Rs = 10kΩ		8 10 18		$\frac{nV}{\sqrt{Hz}}$
THD	Total Harmonic Distortion A_v = 20dB R_L = 2kΩ V_o = $2V_{pp}$ f = 1kHz		0.03		%
$\pm V_{opp}$	Output Voltage Swing R_L = 2kΩ V_{cc} = ±15V V_{cc} = ± 4V	±13	 ±3		V
V_{opp}	Large Signal Voltage Swing R_L = 10kΩ f = 10kHz		28		V_{pp}
SR	Slew Rate Unity Gain, RL = 2kΩ	0.8	1.5		V/µs
CMR	Common Mode Rejection Ratio V_{ic} = ±10V	90			dB
SVR	Supply Voltage Rejection Ratio	90			dB
V_{o1}/V_{o2}	Channel Separation, f = 1kHz		120		dB

MACROMODEL

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** Standard Linear Ics Macromodels, 1993.
** CONNECTIONS :
* 1 INVERTING INPUT
* 2 NON-INVERTING INPUT
* 3 OUTPUT
* 4 POSITIVE POWER SUPPLY
* 5 NEGATIVE POWER SUPPLY

.SUBCKT TS512 1 3 2 4 5 (analog)
*******************************************************
.MODEL MDTH D IS=1E-8 KF=6.565195E-17
CJO=10F
* INPUT STAGE
CIP 2 5 1.000000E-12
CIN 1 5 1.000000E-12
EIP 10 5 2 5 1
EIN 16 5 1 5 1
RIP 10 11 2.600000E+01
RIN 15 16 2.600000E+01
RIS 11 15 1.061852E+02
DIP 11 12 MDTH 400E-12
DIN 15 14 MDTH 400E-12
VOFP 12 13 DC 0
VOFN 13 14 DC 0
IPOL 13 5 1.000000E-05
CPS 11 15 12.47E-10
DINN 17 13 MDTH 400E-12
VIN 17 5 1.500000e+00
DINR 15 18 MDTH 400E-12
VIP 4 18 1.500000E+00
FCP 4 5 VOFP 3.400000E+01
FCN 5 4 VOFN 3.400000E+01
FIBP 2 5 VOFN 1.000000E-02
FIBN 5 1 VOFP 1.000000E-02
* AMPLIFYING STAGE
FIP 5 19 VOFP 9.000000E+02
FIN 5 19 VOFN 9.000000E+02
RG1 19 5 1.727221E+06
RG2 19 4 1.727221E+06
CC 19 5 6.000000E-09
DOPM 19 22 MDTH 400E-12
DONM 21 19 MDTH 400E-12
HOPM 22 28 VOUT 6.521739E+03
VIPM 28 4 1.500000E+02
HONM 21 27 VOUT 6.521739E+03
VINM 5 27 1.500000E+02
GCOMP 5 4 4 5 6.485084E-04
RPM1 5 80 1E+06
RPM2 4 80 1E+06
GAVPH 5 82 19 80 2.59E-03
RAVPHGH 82 4 771
RAVPHGB 82 5 771
RAVPHDH 82 83 1000
RAVPHDB 82 84 1000
CAVPHH 4 83 0.331E-09
CAVPHB 5 84 0.331E-09
EOUT 26 23 82 5 1
VOUT 23 5 0
ROUT 26 3 6.498455E+01
COUT 3 5 1.000000E-12
DOP 19 25 MDTH 400E-12
VOP 4 25 1.742230E+00
DON 24 19 MDTH 400E-12
VON 24 5 1.742230E+00
.ENDS
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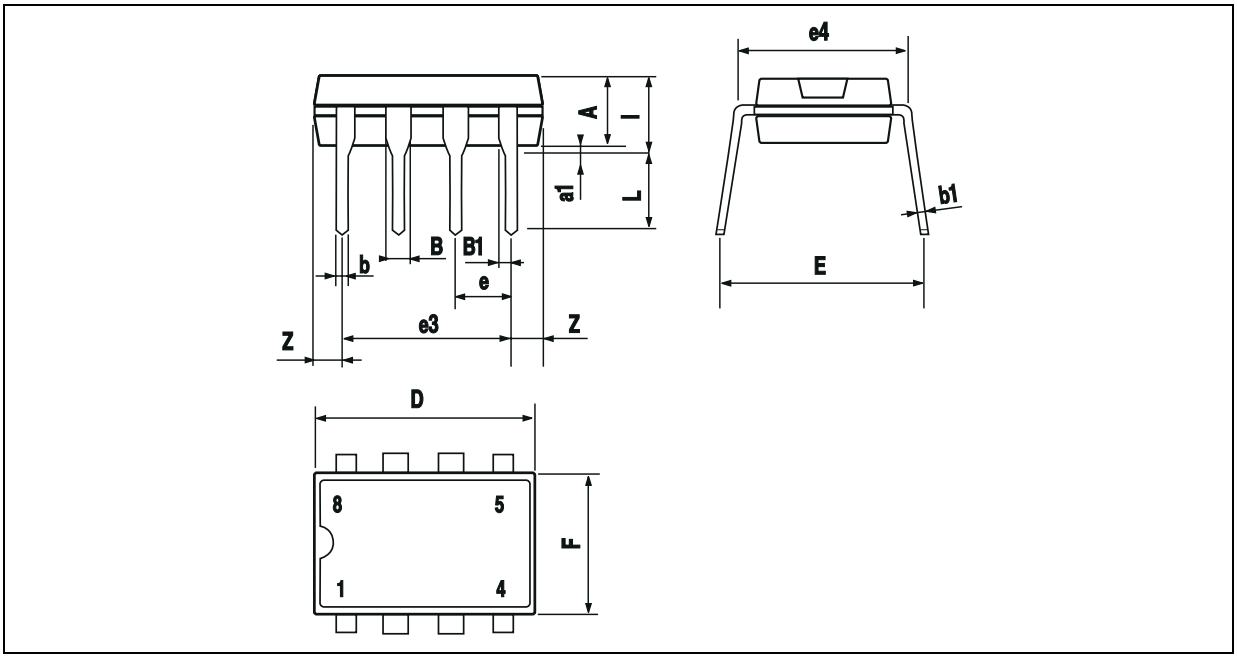
ELECTRICAL CHARACTERISTICS

V_{cc} = ±15V, T_{amb} = 25°C (unless otherwise specified)

Symbol	Conditions	Value	Unit
V_{io}		0	mV
A_{vd}	R_L = 2kΩ	100	V/mV
I_{cc}	No load, per operator	350	µA
V_{icm}		-13.5 to 13.5	V
V_{OH}	R_L = 2kΩ	+13	V
V_{OL}	R_L = 2kΩ	-13	V
I_{sink}	V_o = 0V	23	mA
I_{source}	V_o = 0V	23	mA
GBP	R_L = 2kΩ, C_L = 100pF	3	MHz
SR	R_L = 2kΩ	1.4	V/µs
∅m	R_L = 2kΩ, C_L = 100pF	55	Degrees

PACKAGE MECHANICAL DATA

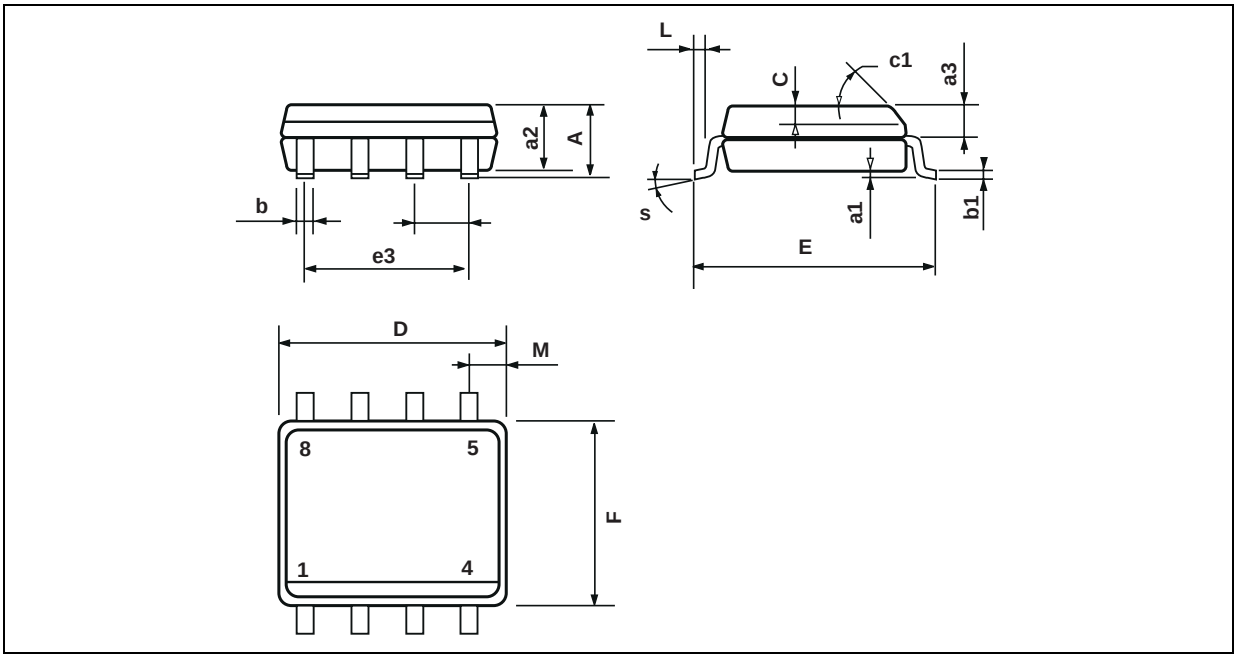
8 PINS - PLASTIC DIP



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

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.)					