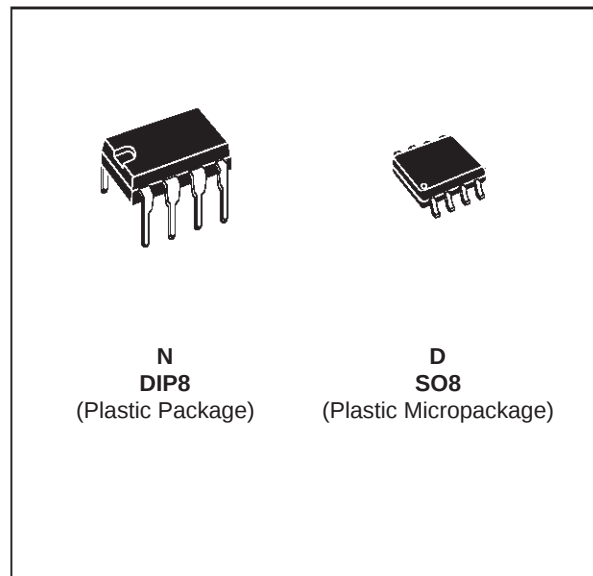




TS921

RAIL TO RAIL HIGH OUTPUT CURRENT SINGLE OPERATIONAL AMPLIFIER

- RAIL TO RAIL INPUT AND OUTPUT
- LOW NOISE : $9\text{nV}/\sqrt{\text{Hz}}$
- LOW DISTORTION
- HIGH OUTPUT CURRENT : **80mA**
(able to drive 32Ω loads)
- HIGH SPEED : **4MHz**, **1V/ μs**
- OPERATING FROM **2.7V to 12V**
- ESD INTERNAL PROTECTION : 1.5KV
- LATCH-UP IMMUNITY



ORDER CODES

Part Number	Temperature Range	Package	
		N	D
TS921I	-40, +125°C	•	•

DESCRIPTION

The TS921 is a RAIL TO RAIL single BiCMOS operational amplifier optimized and fully specified for 3V and 5V operations.

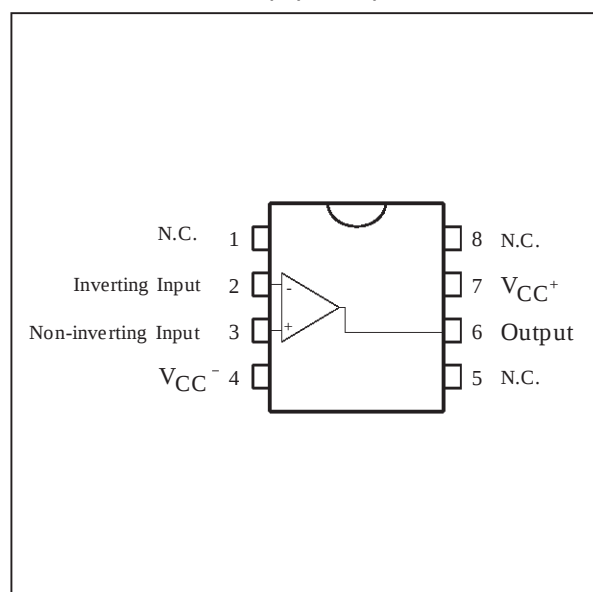
It exhibits a very low noise, low distortion and high output current capability making this device an excellent choice for high quality, low voltage or battery operated audio systems.

The TS921 remains stable when charging the output with capacitive loads up to 500pF.

APPLICATIONS

- headphone amplifier
- piezoelectric speaker
- sound cards, multimedia systems
- line driver, actuator driver
- servo amplifier
- mobile phone and portable communication sets
- instrumentation with low noise as a key factor

PIN CONNECTIONS (top view)



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CC}	Supply Voltage - (note 1)	12	V
V_{id}	Differential Input Voltage - (note 2)	± 1	V
V_i	Input Voltage - (note 3)	-0.3 to 14	V
T_{oper}	Operating Free Air Temperature Range	-40 to +125	$^{\circ}\text{C}$
T_{stg}	Storage Temperature	-65 to +150	$^{\circ}\text{C}$
T_j	Maximum Junction Temperature	150	$^{\circ}\text{C}$
	Output Short Circuit Duration	see note 4	$^{\circ}\text{C}$

Notes :

1. All voltage values, except differential voltage are with respect to network ground terminal.
2. Differential voltages are the non-inverting input terminal with respect to the inverting input terminal.
3. The magnitude of input and output voltages must never exceed $V_{CC}^{+} + 0.3\text{V}$.
4. Short-circuits can cause excessive heating.

OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
V_{CC}	Supply Voltage	2.7 to 12	V
V_{icm}	Common Mode Input Voltage Range	$V_{CC}^{-} - 0.2$ to $V_{CC}^{+} + 0.2$	V

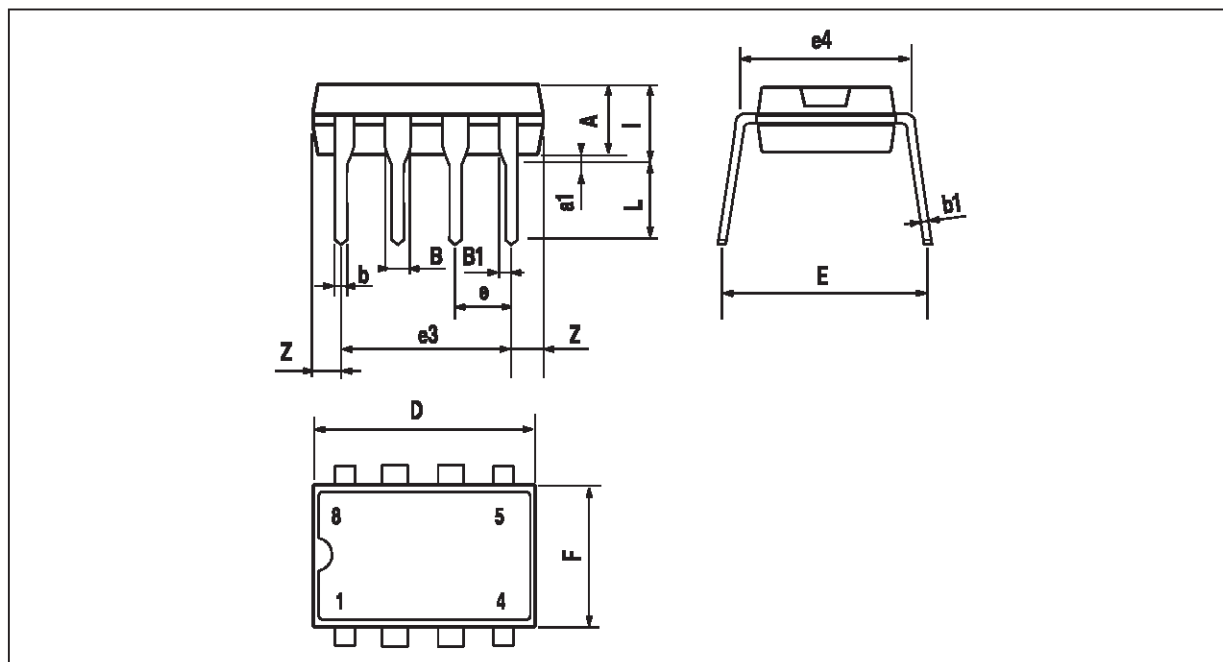
ELECTRICAL CHARACTERISTICS
 $V_{CC}^+ = 3V$, $T_{amb} = 25^{\circ}C$ (unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Unit
V_{io}	Input Offset Voltage $T_{min.} \leq T_{amb} \leq T_{max.}$			3 5	mV
DV_{io}	Input Offset Voltage Drift		2		$\mu V/^{\circ}C$
I_{io}	Input Offset Current $V_{out} = 1.5V$			30	nA
I_{ib}	Input Bias Current $V_{out} = 1.5V$		15	100	nA
V_{OH}	High Level Output Voltage $R_L = 600\Omega$ $R_L = 32\Omega$	2.87	2.63		V
V_{OL}	Low Level Output Voltage $R_L = 600\Omega$ $R_L = 32\Omega$		180	100	mV
A_{vd}	Large Signal Voltage Gain ($V_{out} = 2V_{pk-pk}$) $R_L = 600\Omega$ $R_L = 32\Omega$		35 16		V/mV
I_{CC}	Supply Current no load, $V_{out} = V_{CC}/2$		1	1.5	mA
GBP	Gain Bandwidth Product $R_L = 600\Omega$		4		MHz
CMR	Common Mode Rejection Ratio	60	80		dB
SVR	Supply Voltage Rejection Ratio $V_{CC} = 2.7$ to $3.3V$	60	80		dB
I_o	Output Short Circuit Current	50	80		mA
SR	Slew Rate	0.7	1		V/ μs
ϕ_m	Phase Margin at Unity Gain $R_L = 600\Omega, C_L = 100pF$		68		Degrees
G_m	Gain Margin $R_L = 600\Omega, C_L = 100pF$		12		dB
e_n	Equivalent Input Noise Voltage $f = 1kHz$		9		$\frac{nV}{\sqrt{Hz}}$
THD	Total Harmonic Distortion $V_{out} = 2V_{pk-pk}$, $F = 1kHz$, $A_V = 1$, $R_L = 600\Omega$		0.005		%

ELECTRICAL CHARACTERISTICS
 $V_{CC}^+ = 5V$, $T_{amb} = 25^{\circ}C$ (unless otherwise specified)

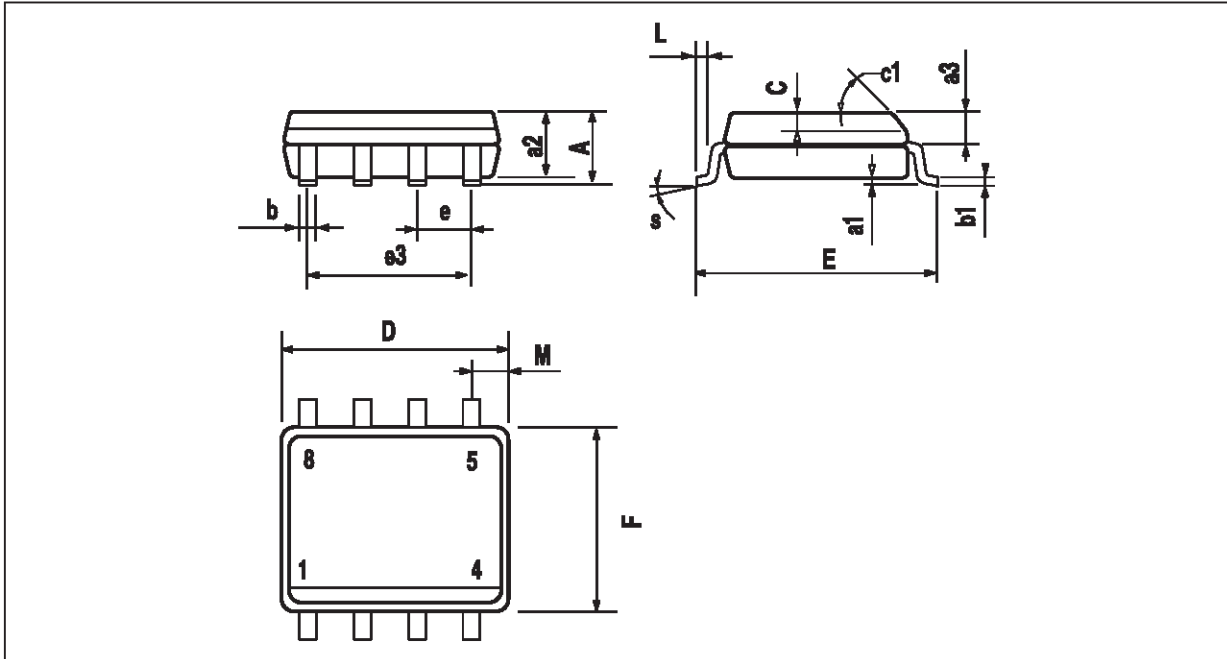
Symbol	Parameter	Min.	Typ.	Max.	Unit
V_{io}	Input Offset Voltage $T_{min.} \leq T_{amb} \leq T_{max.}$			3 5	mV
DV_{io}	Input Offset Voltage Drift		2		$\mu V/^{\circ}C$
I_{io}	Input Offset Current $V_{out} = 1.5V$			30	nA
I_{ib}	Input Bias Current $V_{out} = 1.5V$		15	100	nA
V_{OH}	High Level Output Voltage $R_L = 600\Omega$ $R_L = 32\Omega$	4.85	4.4		V
V_{OL}	Low Level Output Voltage $R_L = 600\Omega$ $R_L = 32\Omega$		300	120	mV
A_{vd}	Large Signal Voltage Gain ($V_{out} = 2V_{pk-pk}$) $R_L = 600\Omega$ $R_L = 32\Omega$		35 16		V/mV
I_{CC}	Supply Current no load, $V_{out} = V_{CC}/2$		1	1.5	mA
GBP	Gain Bandwidth Product $R_L = 600\Omega$		4		MHz
CMR	Common Mode Rejection Ratio	60	80		dB
SVR	Supply Voltage Rejection Ratio $V_{CC} = 2.7$ to $3.3V$	60	80		dB
I_o	Output Short Circuit Current	50	80		mA
SR	Slew Rate	0.7	1		V/ μs
ϕ_m	Phase Margin at Unity Gain $R_L = 600\Omega, C_L = 100pF$		68		Degrees
G_m	Gain Margin $R_L = 600\Omega, C_L = 100pF$		12		dB
e_n	Equivalent Input Noise Voltage $f = 1kHz$		9		$\frac{nV}{\sqrt{Hz}}$
THD	Total Harmonic Distortion $V_{out} = 2V_{pk-pk}$, $F = 1kHz$, $A_V = 1$, $R_L = 600\Omega$		0.005		%

PACKAGE MECHANICAL DATA **8 PINS - PLASTIC PACKAGE**



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			0.260
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)



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° (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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