TS951

LOW POWER RAIL TO RAIL SINGLE OPERATIONAL AMPLIFIER

- INPUT AND OUTPUT RAIL TO RAIL
- OPERATING FROM 2.7V to 12V
- HIGH SPEED (3MHz, 1V/µs)
- LOW CONSUMPTION (0.9mA @3V)
- AVAILABLE IN **SOT23-5 MICROPACKAGE**
- ESD PROTECTION : 2000V
- LATCH-UP FREE

D
SO8
(Plastic Micropackage)

L
SOT-23L
(Plastic Micropackage)

DESCRIPTION

The TS951 is a RAIL TO RAIL single BiCMOS operational amplifier optimized and fully specified for 3V and 5V operations.
It is housed in the space-saving 5 pins SOT23-5 package that makes it well-suited for battery-powered systems. This micropackage simplifies the board design because of the ability to be placed everywhere (outside dimensions are : 2.8mm x 2.9mm)

APPLICATIONS

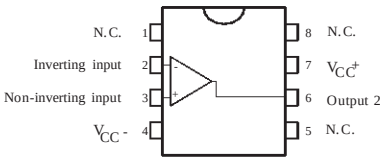
- nomadics equipments (CD player, PDA ...)
- portable communication sets (phone, pager ...)
- instrumentation & sensoring

ORDER CODES

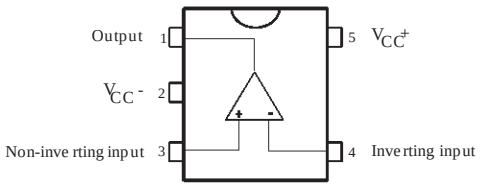
Part Number	Temperature Range	Package		SOT Marking
		L	D	
TS951I	-40, +125°C	•	•	K101

PIN CONNECTIONS

SO8



SOT-23L



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_{in}	Input Voltage - note 3	-0.3 to 12.3	V
T_{oper}	Operating Free Air Temperature Range	-40 to +125	°C
T_{stg}	Storage Temperature	-65 to +150	°C
T_j	Maximum Junction Temperation	150	°C
R_{thjc}	Thermal Resistance Junction to Case	81	°C/W
R_{thja}	Thermal Resistance Junction to Ambient	256	°C/W
	Output Short Circuit Duration	see note 4	

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

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°C (unless otherwise specified)

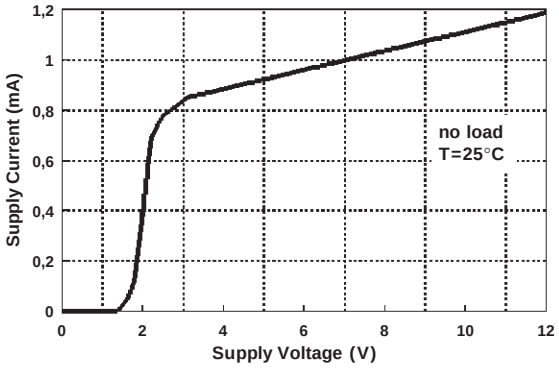
Symbol	Parameter		Min.	Typ.	Max.	Unit
V_{io}	Input Offset Voltage $T_{min.} \le T_{amb} \le T_{max.}$				6 8	mV
DV_{io}	Input Offset Voltage Drift			2		µV/°C
I_{io}	Input Offset Current $T_{min.} \le T_{amb} \le T_{max.}$			1	30 80	nA
I_{ib}	Input Bias Current V_{icm} = 1.5V $T_{min.} \le T_{amb} \le T_{max.}$			35	100 200	nA
V_{OH}	High Level Output Voltage	R_L = 600Ω	2.8	2.9		V
V_{OL}	Low Level Output Voltage	R_L = 600Ω		80	250	mV
A_{vd}	Large Signal Voltage Gain	V_{out} = 2Vpk-pk R_L = 600Ω		10		V/mV
CMR	Common Mode Rejection Ratio		50	80		dB
SVR	Supply Voltage Rejection Ratio V_{CC} = 2.7V to 3.3V		55	80		dB
I_{sink}	Output Sink Current		10	25		mA
I_{source}	Output Source Current		10	22		mA
GBP	Gain Bandwidth Product	R_L = 2kΩ		3		MHz
SR	Slew Rate			1		V/µs
∅m	Phase Margin at Unity Gain	R_L = 600Ω, C_L = 100pF		60		Degrees
G_m	Gain Margin	R_L = 600Ω, C_L = 100pF		10		dB
I_{CC}	Supply Current	No load, $V_{out} = V_{CC/2}$		0.9	1.3	mA
e_n	Equivalent Input Noise Voltage	f = 1kHz		25		$\frac{nV}{\sqrt{Hz}}$
THD	Total Harmonic Distortion	V_{out} = 4Vpk-pk, f = 10kHz A_V = 2, R_L = 10k		0.01		%

ELECTRICAL CHARACTERISTICS

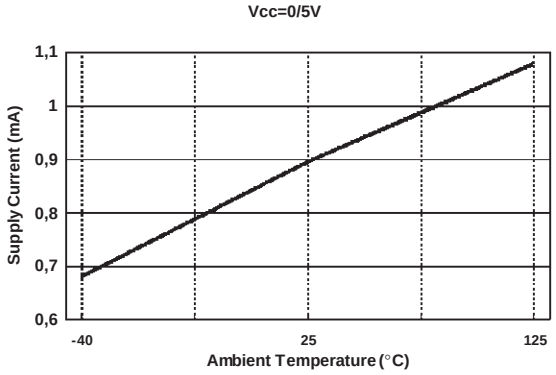
V_{CC}^+ = +5V, T_{amb} = 25°C (unless otherwise specified)

Symbol	Parameter		Min.	Typ.	Max.	Unit
V_{io}	Input Offset Voltage $T_{min.} \le T_{amb} \le T_{max.}$				6 8	mV
DV_{io}	Input Offset Voltage Drift			2		µV/°C
I_{io}	Input Offset Current $T_{min.} \le T_{amb} \le T_{max.}$			1	30 80	nA
I_{ib}	Input Bias Current V_{icm} = 2.5V $T_{min.} \le T_{amb} \le T_{max.}$			35	100 200	nA
V_{OH}	High Level Output Voltage	R_L = 600Ω	4.7	4.8		V
V_{OL}	Low Level Output Voltage	R_L = 600Ω		80	300	mV
A_{vd}	Large Signal Voltage Gain	V_{out} = 2Vpk-pk R_L = 600Ω		20		V/mV
CMR	Common Mode Rejection Ratio		50	80		dB
SVR	Supply Voltage Rejection Ratio V_{CC} = 3V to 5V		55	80		dB
I_{sink}	Output Sink Current		10	25		mA
I_{source}	Output Source Current		10	22		mA
GBP	Gain Bandwidth Product	R_L = 2kΩ		3		MHz
SR	Slew Rate			1		V/µs
∅m	Phase Margin at Unity Gain	R_L = 600Ω, C_L = 100pF		60		Degrees
G_m	Gain Margin	R_L = 600Ω, C_L = 100pF		10		dB
I_{CC}	Supply Current	No load, $V_{out} = V_{CC/2}$		0.95	1.4	mA
e_n	Equivalent Input Noise Voltage	f = 1kHz		25		$\frac{nV}{\sqrt{Hz}}$
THD	Total Harmonic Distortion	V_{out} = 4Vpk-pk, f = 10kHz A_V = 2, R_L = 10k		0.01		%

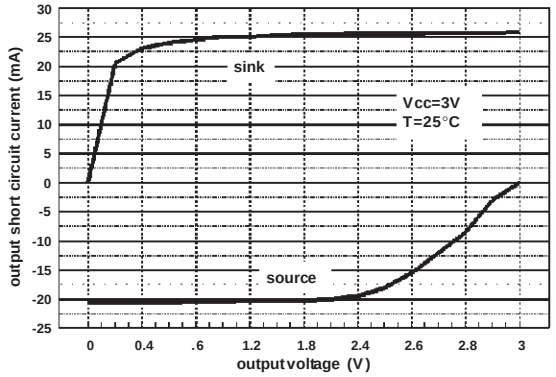
SUPPLY CURRENT VERSUS SUPPLY VOLTAGE



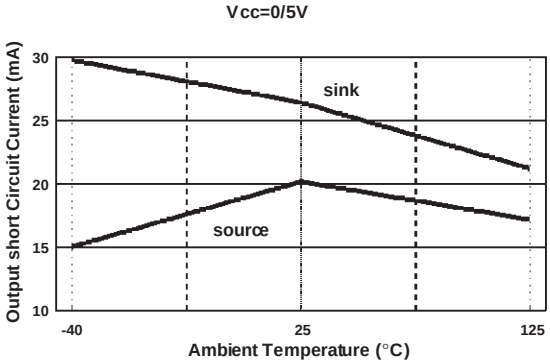
SUPPLY CURRENT VERSUS TEMPERATURE



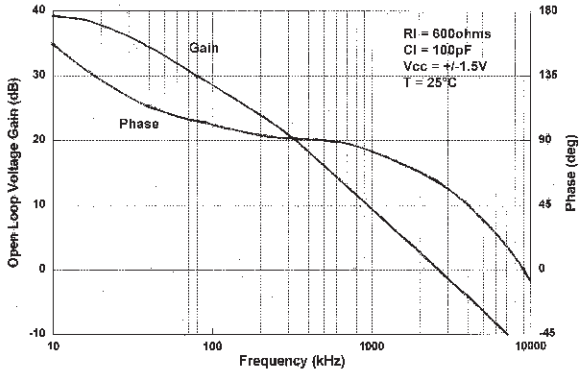
OUTPUT SHORT CIRCUIT CURRENT VERSUS OUTPUT VOLTAGE



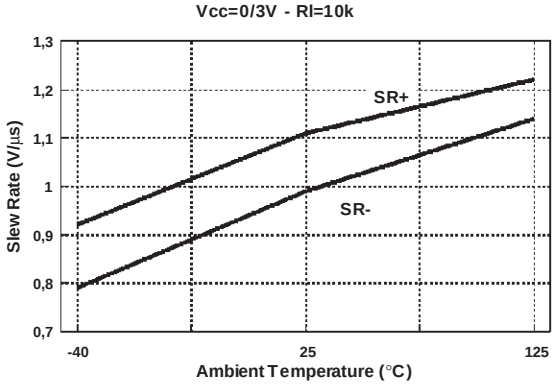
OUTPUT SHORT CIRCUIT CURRENT VERSUS TEMPERATURE



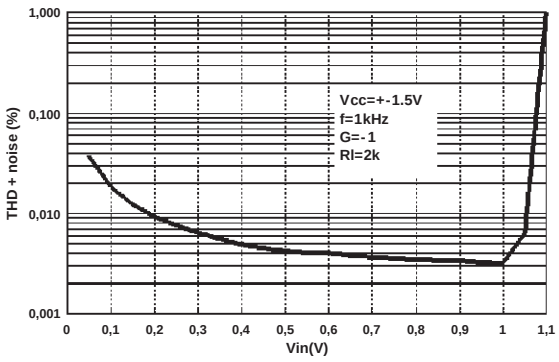
VOLTAGE GAIN AND PHASE VERSUS FREQUENCY



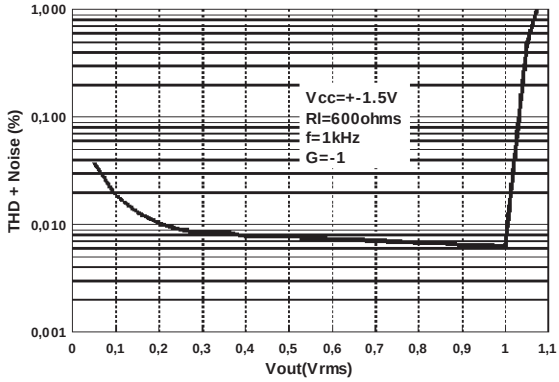
SLEW RATE VERSUS TEMPERATURE



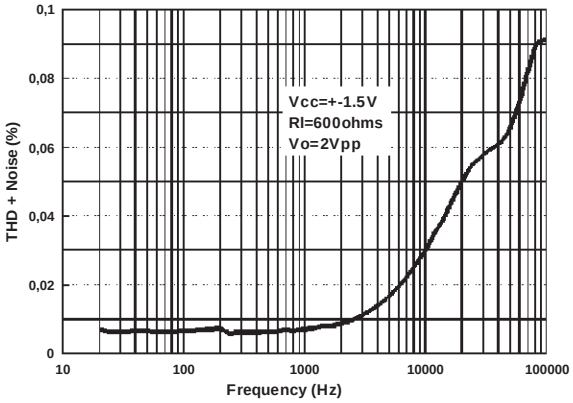
THD + NOISE VERSUS V_{out}



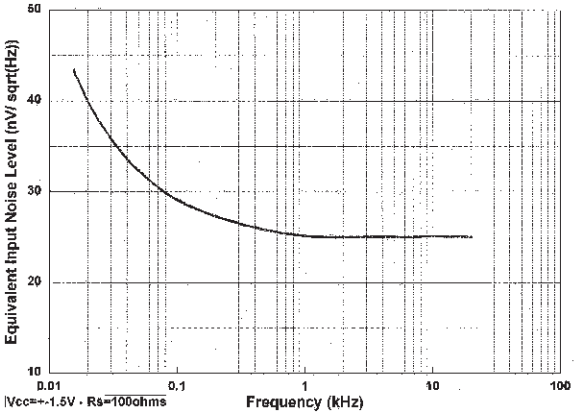
THD + NOISE VERSUS V_{out}



THD + NOISE VERSUS FREQUENCY

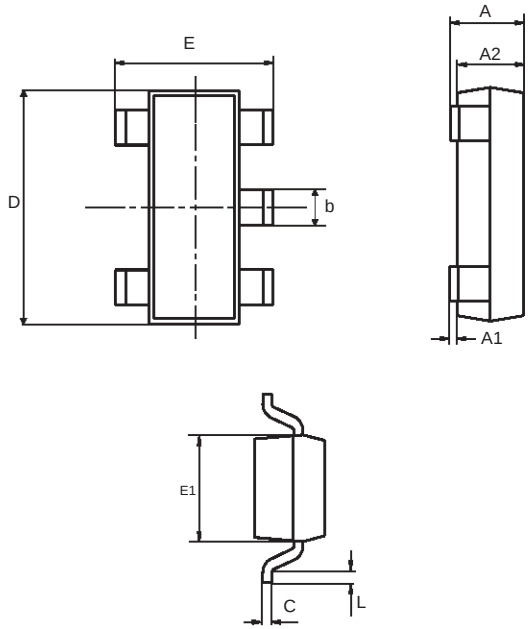


EQUIVALENT INPUT NOISE VOLTAGE VERSUS FREQUENCY



PACKAGE MECHANICAL DATA

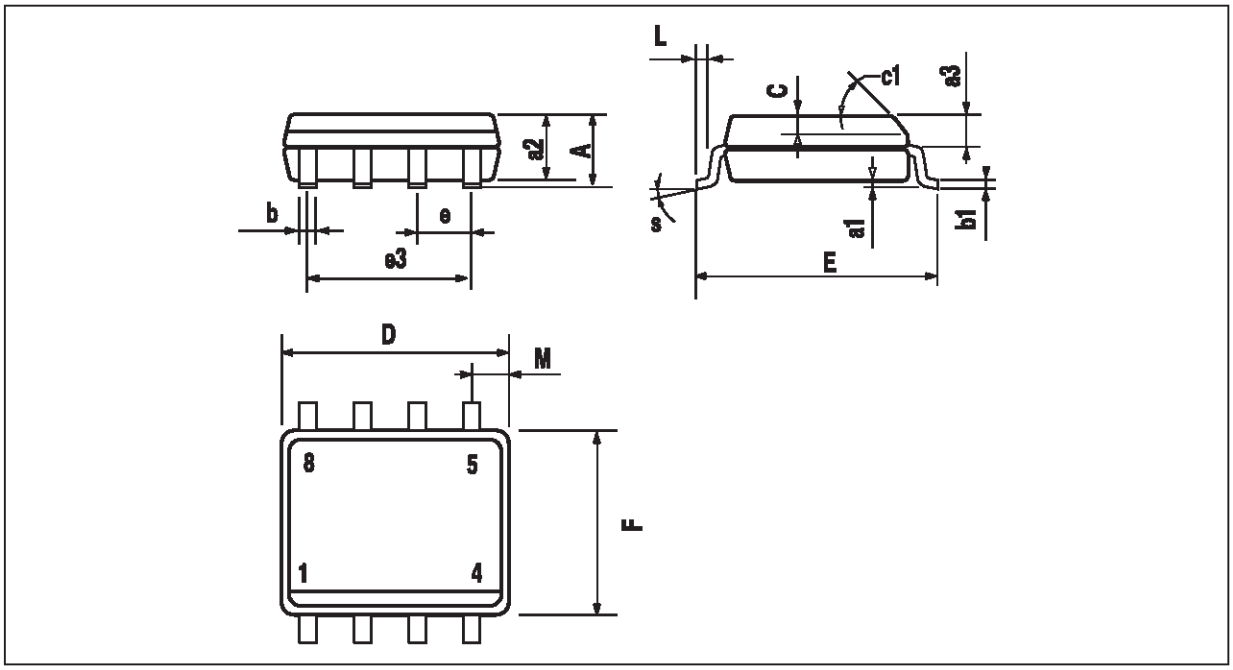
5 PINS -TINY PACKAGE (SOT23)



Dim.	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	0.90	1.45	0.034	0.057
A1	0	0.15		0.006
A2	0.90	1.30	0.034	0.051
b	0.35	0.50	0.013	0.020
C	0.09	0.20	0.003	0.008
D	2.80	3.00	0.110	0.118
E	2.60	3.00	0.102	0.118
E1	1.50	1.75	0.059	0.069
L	0.10	0.60	0.003	0.024

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.)					