



TS942

3V OUTPUT RAIL TO RAIL MICROPOWER DUAL BiCMOS OPERATIONAL AMPLIFIERS

- **MICROPOWER CONSUMPTION :**
1.2µA/operator
- **RAIL TO RAIL OUTPUT VOLTAGE RANGE**
- **SINGLE SUPPLY OPERATION FROM**
2.6V TO 10V
- **EXTREMELY LOW INPUT BIAS CURRENT :**
1pA typ.
- **ESD TOLERANCE :** 2kV
- **LATCH UP IMMUNITY**

DESCRIPTION

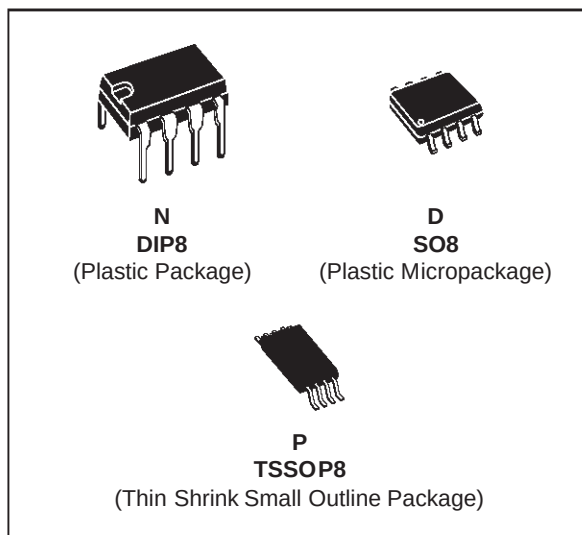
The TS942 is an output RAIL TO RAIL dual BiCMOS operational amplifier offering an extremely low consumption of 1.2µA/op.

This current is stable over the single supply operating range 2.6V to 10V.

The output reaches :

□ $V_{CC}^- + 150\text{mV}$ $V_{CC}^+ - 150\text{mV}$ with $R_L = 10\text{k}\Omega$

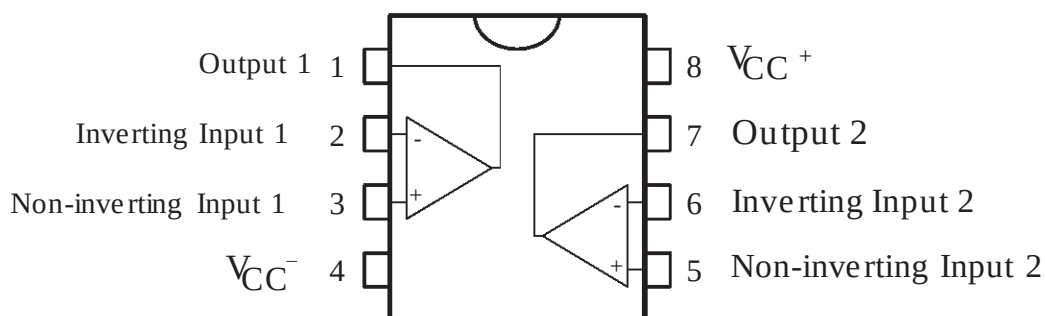
This device is particularly well suited for battery supplied systems (alarm, smoke detector, battery charge control, pH meter...).



ORDER CODES

Part Number	Temperature Range	Package		
		N	D	P
TS942I	-40, +85°C	•	•	•

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)	± 12	V
V_i	Input Voltage - (note 3)	-0.3 to $V_{CC}^{+} + 0.3$	V
T_{oper}	Operating Free Air Temperature Range	-40 to $+85$	$^{\circ}\text{C}$
T_{stg}	Storage Temperature	-65 to $+150$	$^{\circ}\text{C}$

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 $V_{CC}^{+} + 0.3\text{V}$.

OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
V_{CC}	Supply Voltage	2.6 to 10	V
V_{icm}	Common Mode Input Voltage Range	$V_{CC}^{-} - 0.2$ to $V_{CC}^{+} - 1.3$	V

ELECTRICAL CHARACTERISTICS

$V_{CC}^{+} = 5\text{V}$, $V_{CC}^{-} = 0\text{V}$, R_L connected to $V_{CC}/2$, $T_{amb} = 25^{\circ}\text{C}$ (unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Unit
V_{io}	Input Offset Voltage TS942 TS942A TS942B			10 5 2	mV
I_{io}	Input Offset Current - (note 1)		1	100	pA
I_{ib}	Input Bias Current - (note 1)		1	150	pA
I_{CC}	Supply Current (per operator) - no load		1.2		μA
V_{icm}	Input Common Mode Voltage Range		-0.2 to $+3.8$		V
A_{vd}	Large Signal Voltage Gain $R_L = 1\text{M}\Omega$, $V_o = 4\text{Vpp}$		100		V/mV
V_{OH}	High Level Output Voltage $V_{id} = 100\text{mV}$ $R_L = 1\text{M}\Omega$ $R_L = 10\text{k}\Omega$		4.99 4.85		V
V_{OL}	Low Level Output Voltage $V_{id} = -100\text{mV}$ $R_L = 1\text{M}\Omega$ $R_L = 10\text{k}\Omega$		5 150		mV
CMR	Common Mode Rejection Ratio		85		dB
SVR	Supply Voltage Rejection Ratio		85		dB
I_o	Output Short Circuit Current $V_{id} = \pm 100\text{mV}$ Source Sink $(V_o = V_{CC}^{-})$ $(V_o = V_{CC}^{+})$		5 6		mA
GBP	Gain Bandwidth Product ($R_L = 1\text{M}\Omega$, $C_L = 50\text{pF}$)		10		kHz
SR	Slew Rate		5		V/ms
ϕ_m	Phase Margin ($C_L = 50\text{pF}$)		65		Degrees

Note 1 : Maximum values including unavoidable inaccuracies of the industrial test.

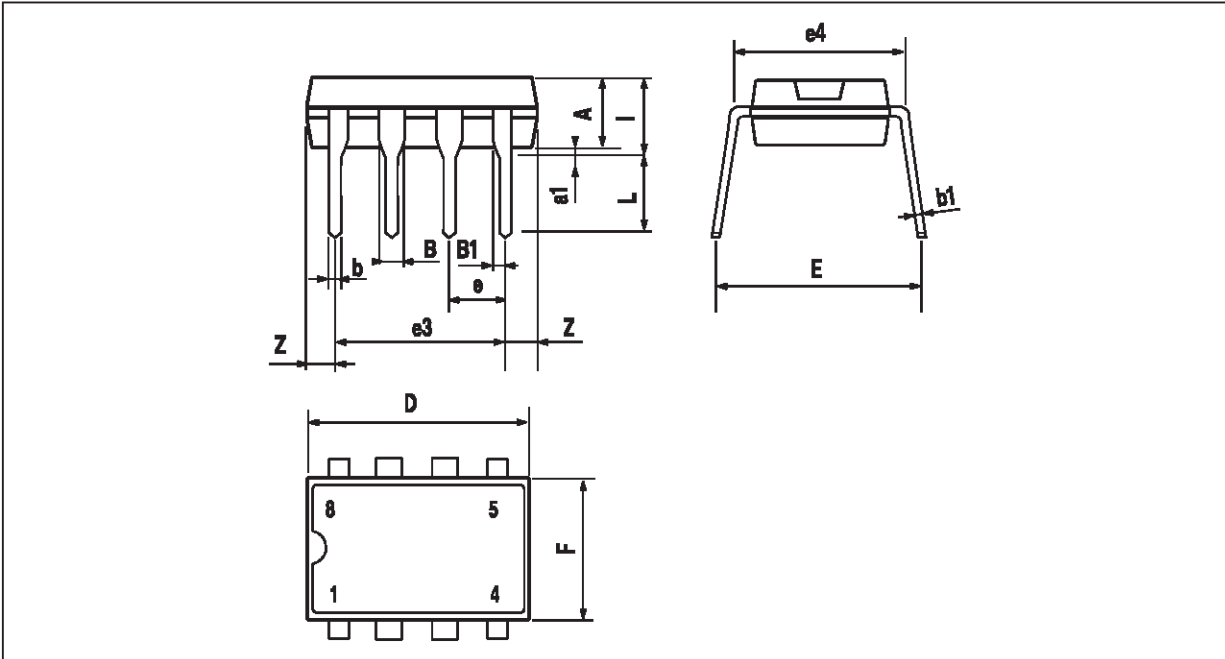
ELECTRICAL CHARACTERISTICS

$V_{CC}^+ = 3V$, $V_{CC}^- = 0V$, R_L connected to $V_{CC}/2$, $T_{amb} = 25^\circ C$ (unless otherwise specified)

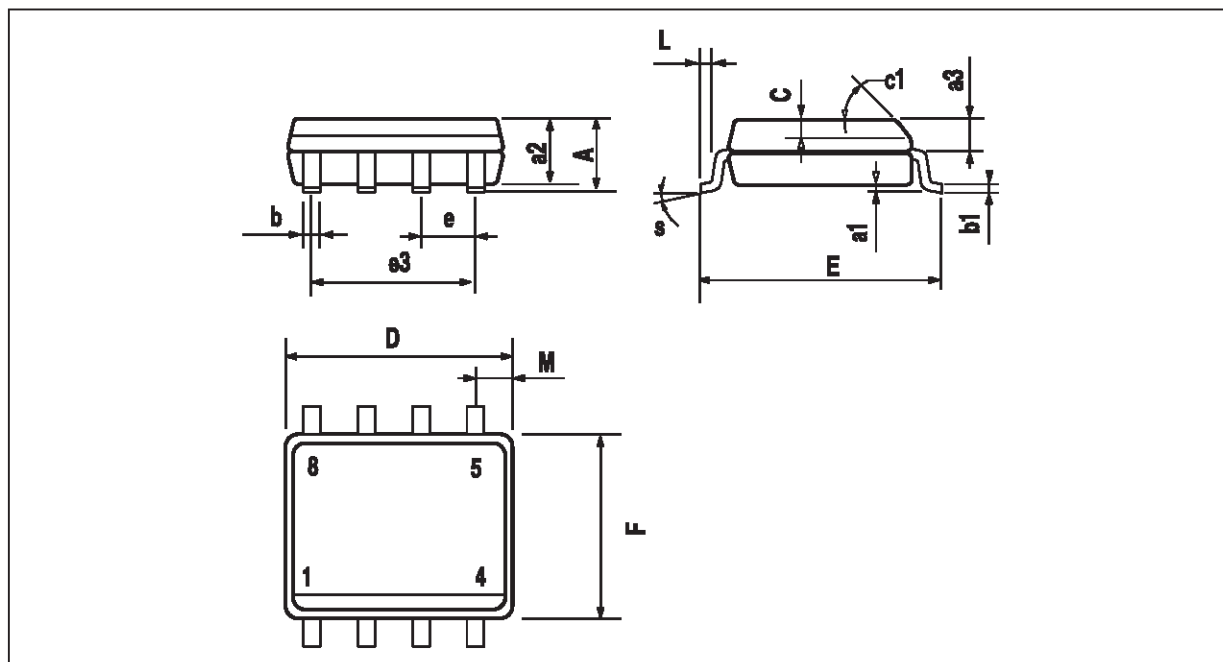
Symbol	Parameter	Min.	Typ.	Max.	Unit
V_{io}	Input Offset Voltage TS942 TS942A TS942B			10 5 2	mV
I_{io}	Input Offset Current - (note 1)		1	100	pA
I_{ib}	Input Bias Current - (note 1)		1	150	pA
I_{CC}	Supply Current (per operator) - no load		1.2		μA
V_{icm}	Input Common Mode Voltage Range		-0.2 to 1.7		V
A_{vd}	Large Signal Voltage Gain $R_L = 1M\Omega$, $V_o = 2V_{pp}$		100		V/mV
V_{OH}	High Level Output Voltage $V_{id} = 100mV$ $R_L = 1M\Omega$ $R_L = 10k\Omega$		2.99 2.85		V
V_{OL}	Low Level Output Voltage $V_{id} = -100mV$ $R_L = 1M\Omega$ $R_L = 10k\Omega$		5 100		mV
CMR	Common Mode Rejection Ratio		85		dB
SVR	Supply Voltage Rejection Ratio		85		dB
I_o	Output Short Circuit Current $V_{id} = \pm 100mV$ Source Sink ($V_o = V_{CC}^-$) ($V_o = V_{CC}^+$)		1.5 1.3		mA
GBP	Gain Bandwidth Product ($R_L = 1M\Omega$, $C_L = 50pF$)		10		kHz
SR	Slew Rate		4		V/ms
ϕ_m	Phase Margin ($C_L = 50pF$)		65		Degrees

Note 1 : Maximum values including unavoidable inaccuracies of the industrial test.

PACKAGE MECHANICAL DATA
8 PINS - PLASTIC DIP



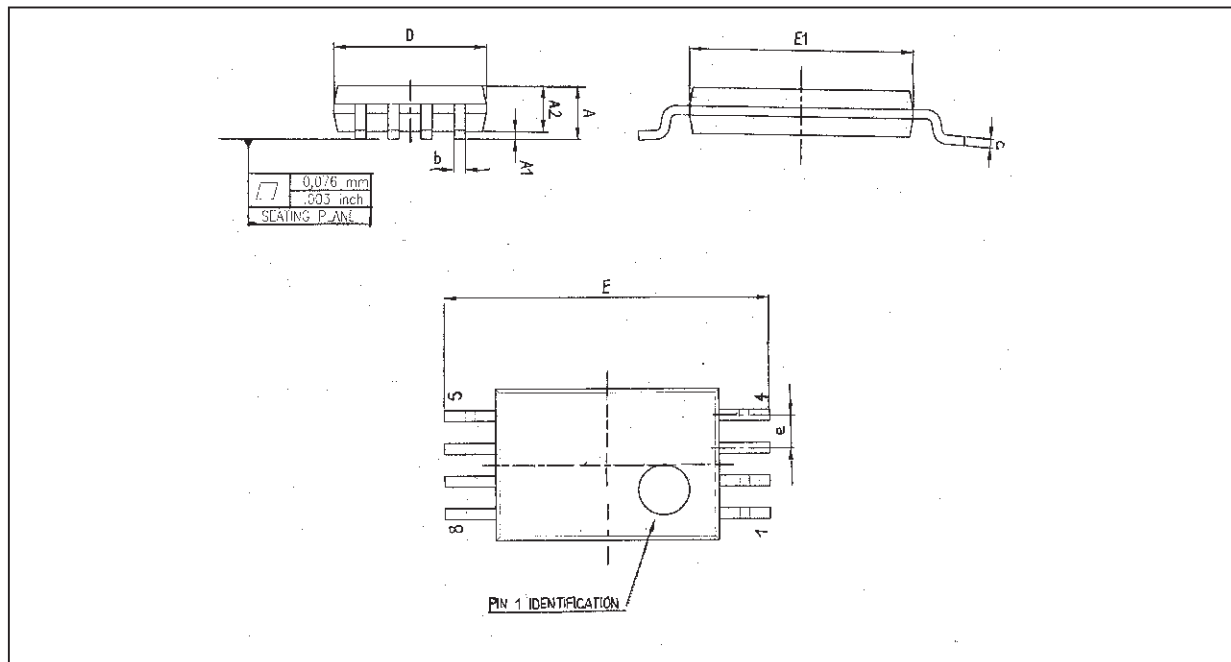
Dimensions	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A		3.32			0.131	
a1	0.51			0.020		
B	1.15		1.65	0.045		0.065
b	0.356		0.55	0.014		0.022
b1	0.204		0.304	0.008		0.012
D			10.92			0.430
E	7.95		9.75	0.313		0.384
e		2.54			0.100	
e3		7.62			0.300	
e4		7.62			0.300	
F			6.6			0.260
i			5.08			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.)					

PACKAGE MECHANICAL DATA

8 PINS - THIN SHRINK SMALL OUTLINE PACKAGE



Dim.	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			1.20			0.05
A1	0.05		0.15	0.01		0.006
A2	0.80	1.00	1.05	0.031	0.039	0.041
b	0.19		0.30	0.007		0.15
c	0.09		0.20	0.003		0.012
D	2.90	3.00	3.10	0.114	0.118	0.122
E		6.40			0.252	
E1	4.30	4.40	4.50	0.169	0.173	0.177
e		0.65			0.025	
k	0°		8°	0°		8°
l	0.50	0.60	0.75	0.09	0.0236	0.030

Information furnished is believed to be accurate and reliable. However, STMicroelectronics assumes no responsibility for the consequences of use of such information nor for any infringement of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of STMicroelectronics. Specifications mentioned in this publication are subject to change without notice. This publication supersedes and replaces all information previously supplied. STMicroelectronics products are not authorized for use as critical components in life support devices or systems without express written approval of STMicroelectronics.

© The ST logo is a trademark of STMicroelectronics

© 1999 STMicroelectronics – Printed in Italy – All Rights Reserved

STMicroelectronics GROUP OF COMPANIES

Australia - Brazil - Canada - China - France - Germany - Italy - Japan - Korea - Malaysia - Malta - Mexico - Morocco
The Netherlands - Singapore - Spain - Sweden - Switzerland - Taiwan - Thailand - United Kingdom - U.S.A.

© <http://www.st.com>

ORDER CODE :