



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

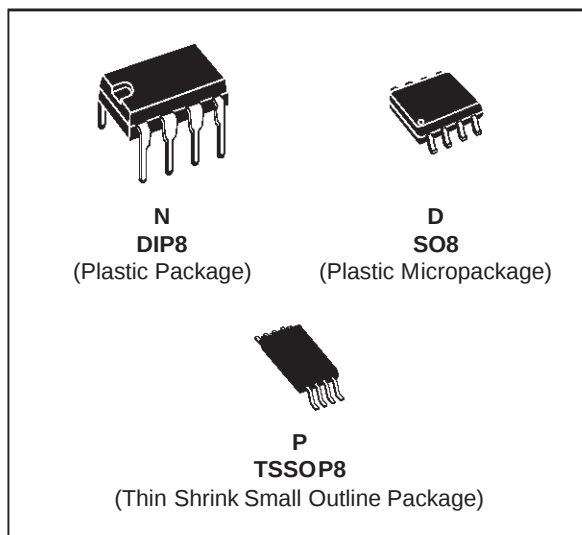
The TS942 is an output RAIL TO RAIL dual BiCMOS operational amplifier offering an extremely low consumption of 1.2µA/op.

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 $R_L = 10\text{k}\Omega$

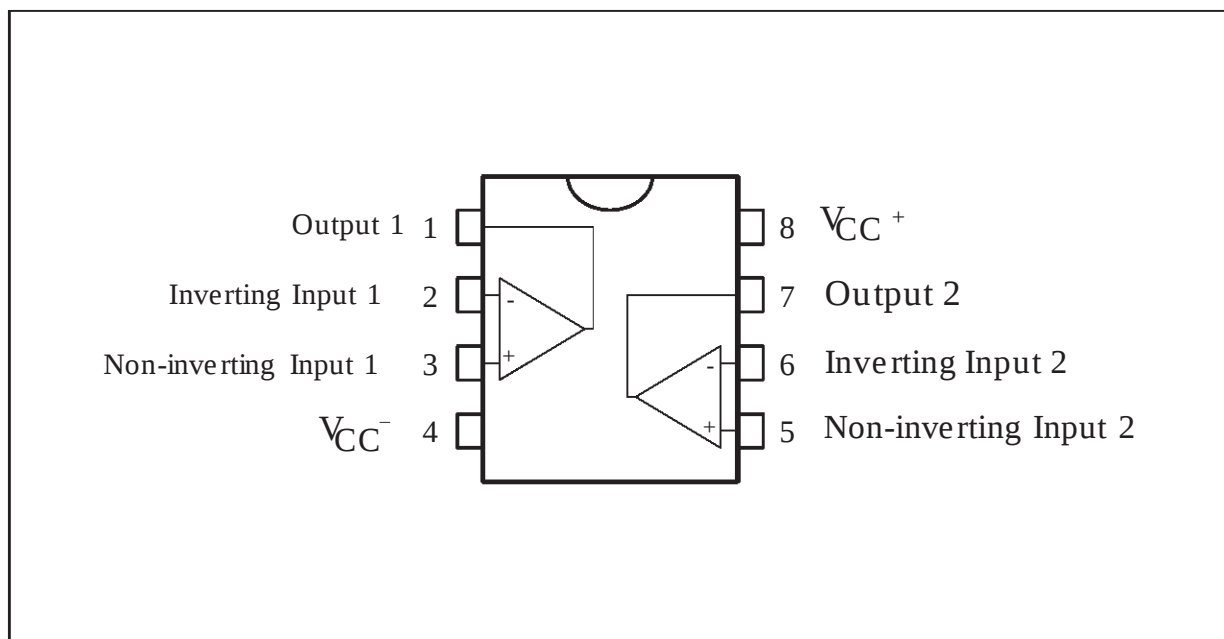
This device is particularly well suited for battery supplied systems (alarm, smoke detector, battery charge control, pH meter...).



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

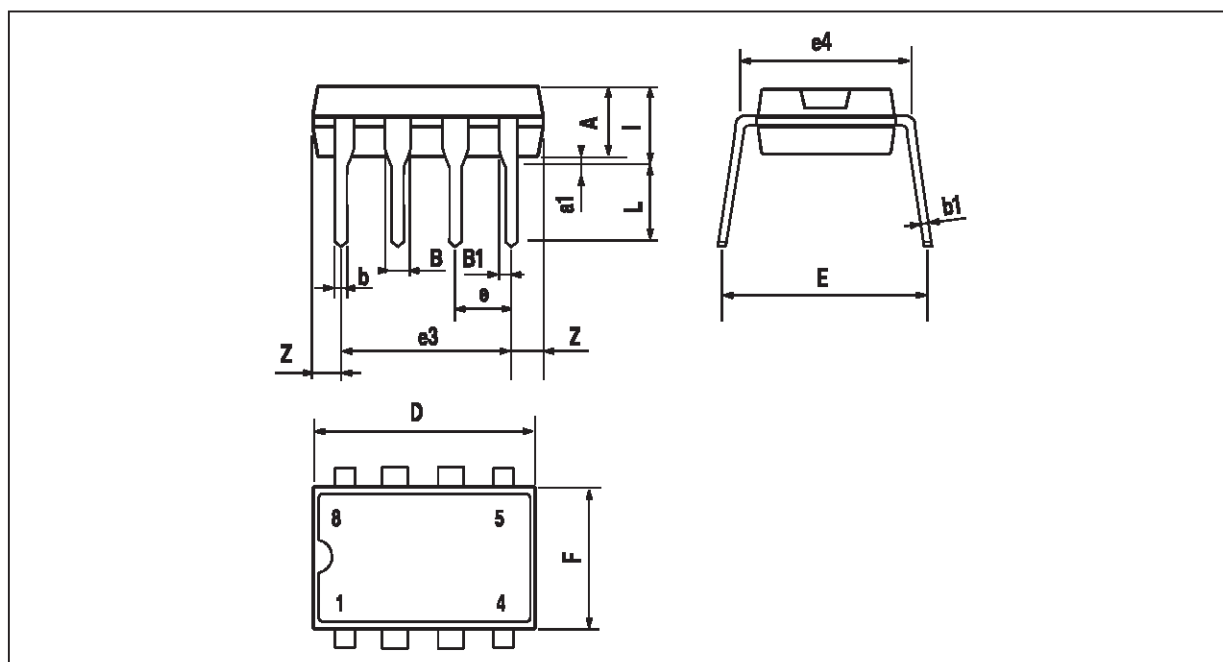
$V_{CC}^+ = 3V$, $V_{CC}^- = 0V$, R_L connected to $V_{CC}/2$, $T_{amb} = 25^\circ C$ (unless otherwise specified)

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

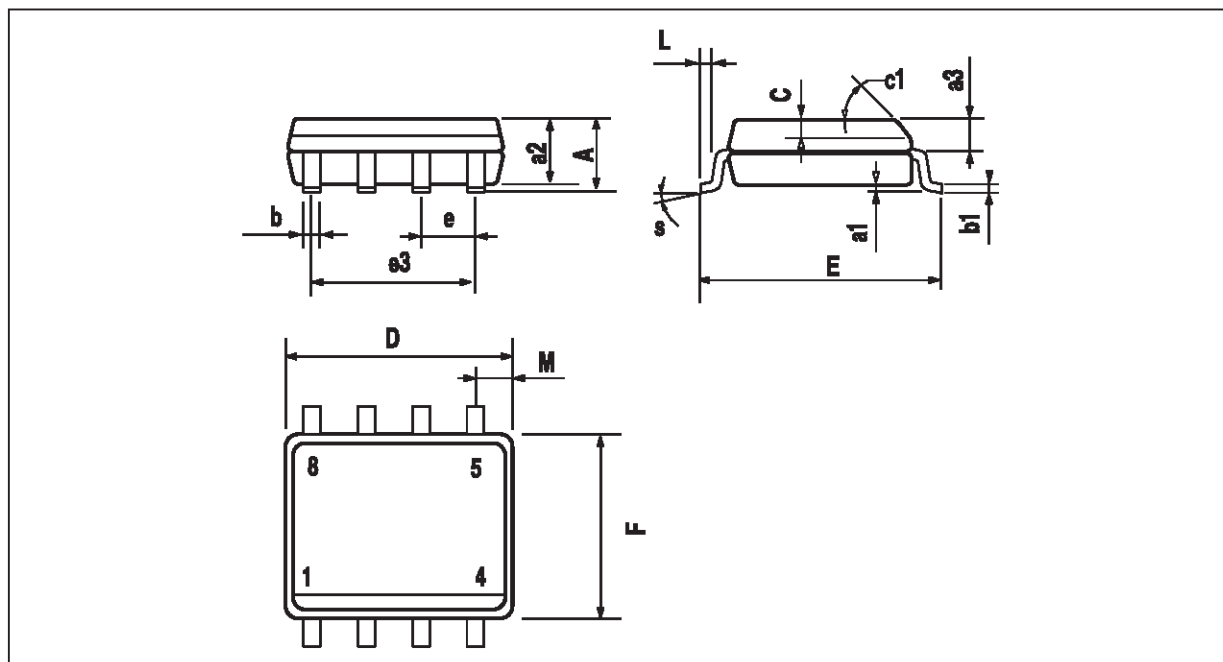
Note 1 : Maximum values including unavoidable inaccuracies of the industrial test.

PACKAGE MECHANICAL DATA

8 PINS - PLASTIC DIP



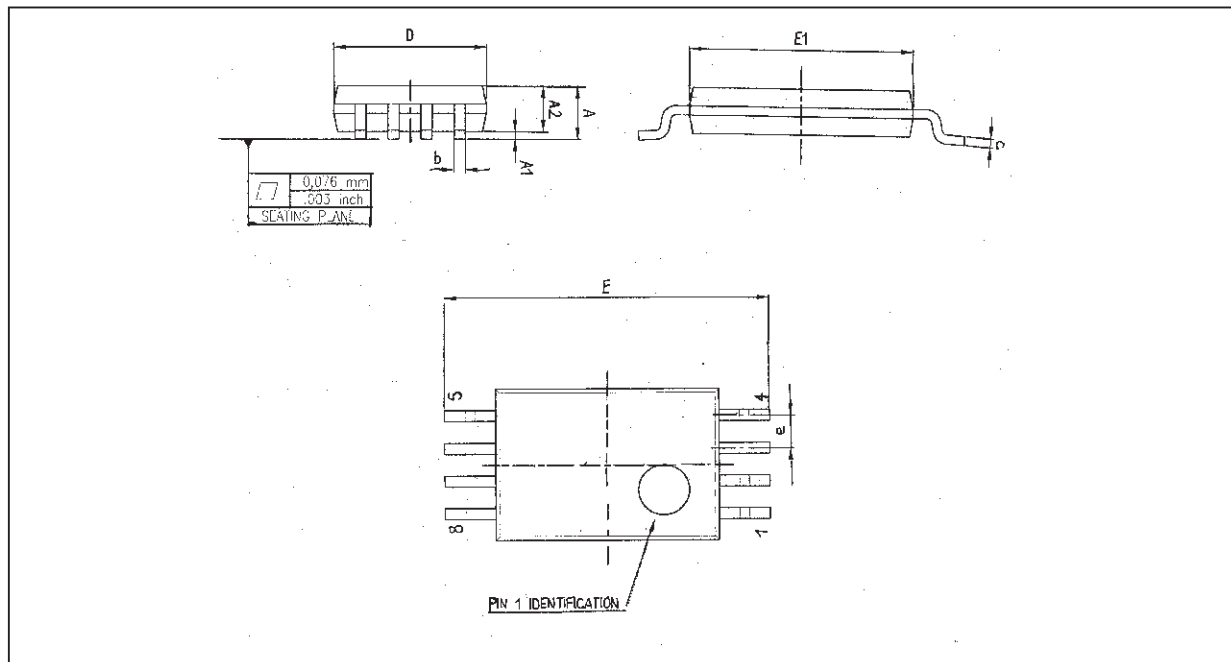
Dimensions	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A		3.32			0.131	
a1	0.51			0.020		
B	1.15		1.65	0.045		0.065
b	0.356		0.55	0.014		0.022
b1	0.204		0.304	0.008		0.012
D			10.92			0.430
E	7.95		9.75	0.313		0.384
e		2.54			0.100	
e3		7.62			0.300	
e4		7.62			0.300	
F			6.6			0.260
i			5.08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

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