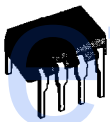
SGS-THOMSON MICROELECTRONICS

TS912

INPUT/OUTPUT **RAIL-TO-RAIL** DUAL CMOS OPERATIONAL AMPLIFIERS

TENTATIVE DATA

- RAIL TO RAIL INPUT AND OUTPUT VOLTAGE RANGE
- SINGLE POWER SUPPLY OPERATION FROM 2.7V TO 16V
- GAIN BANDWIDTH PRODUCT OF 1MHz
- LOW SUPPLY CURRENT : 350µA/Ampli
- EXTREMELY LOW INPUT BIAS CURRENT 1pA TYP
- LOW IMPEDANCE 100Ω DRIVING CAPABILITY
- SLEW RATE : 1V/µs
- LOW NOISE : 40nV/$\sqrt{Hz}$
- ESD INTERNAL PROTECTION DIODES
- LOW INPUT OFFSET VOLTAGE : 1.5mV max.



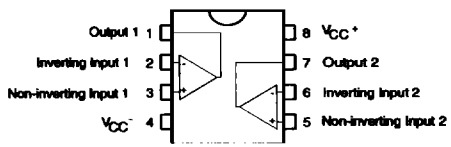
N
DIP8
(Plastic Package)

ORDER CODES

Part Number	Temperature Range	Package
		N
TS912C/AC/BC	0, +70°C	•
TS912I/AI/BI	-40, +105°C	•
TS912M/AM/BM	-55, +125°C	•

912-01.TBL

PIN CONNECTIONS (top view)

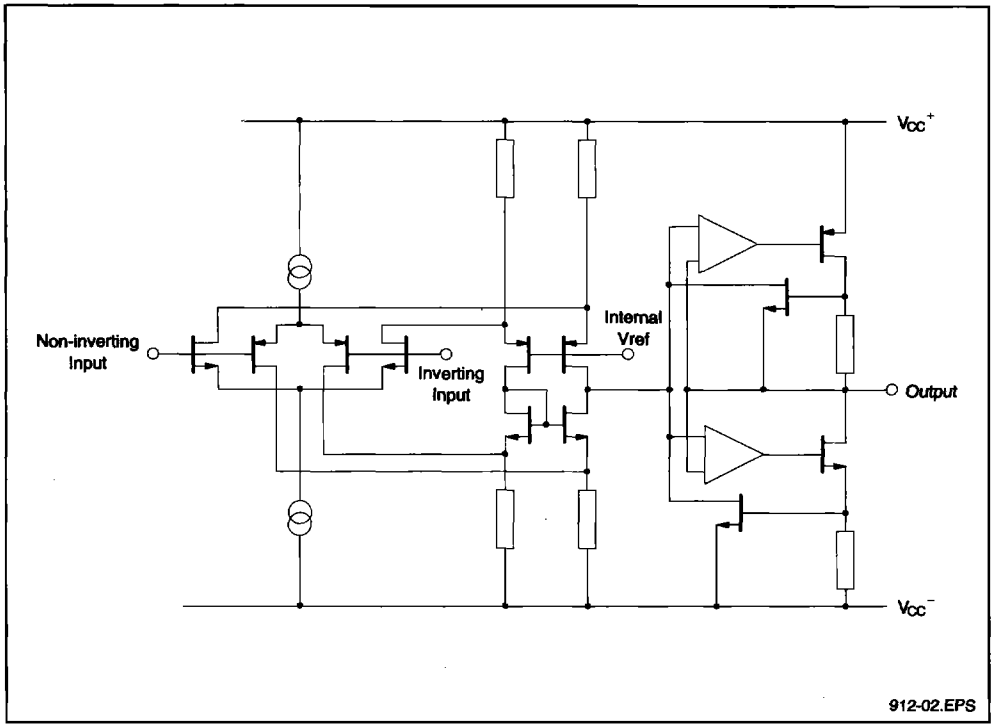


912-01.EPS

DESCRIPTION

The TS912 is a Rail-to-Rail dual CMOS operational amplifier designed to operate with single or dual supply voltage.
The input voltage range V_{icm} includes the two supply rails V_{CC}^+ and V_{CC}^-.
The output reaches (V_{CC}^- +50mV ; V_{CC}^+ -50mV) with R_L = 10kΩ and (V_{CC}^- +650mV ; V_{CC}^+ -650mV) with R_L = 600Ω.
This product offers a broad supply voltage operating range from 2.7V to 16V and a supply current of only 350µA/amp. (V_{CC} = 10V).
Source and sink output capability is typically 80mA (at V_{CC} = ±5V), fixed by an internal limitation circuit.

SCHEMATIC DIAGRAM (1/2 TS912)



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CC}^+	Supply Voltage - (note 1)	18	V
V_{id}	Differential Input Voltage - (note 2)	±18	V
V_i	Input Voltage - (note 3)	-0.3 to 18	V
I_{in}	Current on Inputs	±50	mA
I_o	Current on Outputs	±130	mA
T_{oper}	Operating Free Air Temperature Range TS912C/AC/BC TS912I/AI/BI TS912M/AM/BM	 0 to +70 -40 to +105 -55 to +125	°C
T_{stg}	Storage Temperature	-65 to +150	°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}^+ +0.3V.

OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
V_{CC}^+	Supply Voltage	2.7 to 16	V
V_{icm}	Common Mode Input Voltage Range	V_{CC}^- -0.2 to V_{CC}^++0.2	V

ELECTRICAL CHARACTERISTICS

$V_{CC}^+ = 10V$, $V_{CC}^- = 0V$, $T_{amb} = 25^oC$ (unless otherwise specified)

Symbol	Parameter		Min.	Typ.	Max.	Unit
V_{io}	Input Offset Voltage	TS912 TS912A TS912B			12 5 1.5	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 amplifier) $A_V = 1$, no load			350	450	µA
V_{icm}	Input Common Mode Voltage Range			-0.2 to +10.2		V
CMR	Common Mode Rejection Ratio $V_{ic} = 3$ to 7V, $V_o = 5V$ $V_{ic} = 0$ to 10V, $V_o = 5V$			100 85		dB
SVR	Supply Voltage Rejection Ratio $V_{CC}^+ = 6$ to 10V, $V_O = 5V$			70		dB
A_{vd}	Large Signal Voltage Gain $R_L = 10k\Omega$		10	40		V/mV
V_{OH}	High Level Output Voltage $V_{id} = 100mV$	$R_L = 100k\Omega$ $R_L = 10k\Omega$ $R_L = 600\Omega$ $R_L = 100\Omega$	9.95 9.85 9.2	 9.95 9.35 8		V
V_{OL}	Low Level Output Voltage $V_{id} = -100mV$	$R_L = 100k\Omega$ $R_L = 10k\Omega$ $R_L = 600\Omega$ $R_L = 100\Omega$		 50 650 2100	50 150 800	mV
I_o	Output Short Circuit Current $V_{id} = \pm 100mV$	Source ($V_o = 0V$) Sink ($V_o = V_{CC}^+$)		90 80		mA
GBP	Gain Bandwidth Product $A_{VCL} = 100$, $R_L = 10k\Omega$, $C_L = 100pF$, f = 100kHz			1		MHz
SR	Slew Rate $A_{VCL} = 1$, $R_L = 10k\Omega$, $C_L = 100pF$, $V_{in} = 2.5V$ to 7.5V			1		V/µs
Øm	Phase Margin			30		Degrees
e_n	Equivalent Input Noise Voltage ($R_s = 100\Omega$, f = 1kHz)			40		$\frac{nV}{\sqrt{Hz}}$
THD	Total Harmonic Distortion $A_{VCL} = 1$, $R_L = 10k\Omega$, $C_L = 100pF$, $V_i = 4.75V$ to 5.25V			0.024		%
C_{in}	Input Capacitance			1.5		pF
V_{O1}/V_{O2}	Channel Separation (f = 1kHz)			120		dB

912-04.TBL

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

ELECTRICAL CHARACTERISTICS

$V_{CC}^+ = 3V$, $V_{CC}^- = 0V$, $T_{amb} = 25°C$ (unless otherwise specified)

Symbol	Parameter		Min.	Typ.	Max.	Unit
V_{io}	Input Offset Voltage	TS912 TS912A TS912B			12 5 1.5	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 amplifier) $A_V = 1$, no load			170	230	µA
V_{icm}	Input Common Mode Voltage Range			-0.2 to +3.2		V
CMR	Common Mode Rejection Ratio $V_{ic} = 0$ to 3V, $V_o \approx 1.5V$			60		dB
SVR	Supply Voltage Rejection Ratio $V_{CC}^+ = 2.7$ to 3.3V, $V_O = 1.5V$			60		dB
A_{vd}	Large Signal Voltage Gain $R_L = 10k\Omega$		3	5		V/mV
V_{OH}	High Level Output Voltage $V_{id} = 100mV$	$R_L = 100k\Omega$ $R_L = 10k\Omega$ $R_L = 600\Omega$ $R_L = 100\Omega$	2.95 2.9 2.2	2.96 2.6 2		V
V_{OL}	Low Level Output Voltage $V_{id} = -100mV$	$R_L = 100k\Omega$ $R_L = 10k\Omega$ $R_L = 600\Omega$ $R_L = 100\Omega$		50 350 900	50 100 600	mV
I_o	Output Short Circuit Current $V_{id} = \pm 100mV$	Source ($V_o = 0V$) Sink ($V_o = V_{CC}^+$)		30 30		mA
GBP	Gain Bandwidth Product $A_{VCL} = 100$, $R_L = 10k\Omega$, $C_L = 100pF$, f = 100kHz			0.6		MHz
SR	Slew Rate $A_{VCL} = 1$, $R_L = 10k\Omega$, $C_L = 100pF$, $V_{in} = 2.5V$ to 7.5V			0.4		V/µs
Øm	Phase Margin			12		Degrees

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