SG1250/SG2250/SG3250 — Single
SG1252/SG2252/SG3252 — Dual
SG1253/SG2253/SG3253 — Triple
SG4250/SG4250C — Single

2

DESCRIPTION

SG1250/1252/1253 operational amplifiers are single, dual, and triple operational amplifiers which have been designed to offer exceptional performance under conditions of extremely low internal power consumption. Quiescent current is determined by a single external resistor which permits operation over a wide range of currents and voltages.

FEATURES

- **Adjustable power consumption to less than 20 microwatts**
- **Supply voltages from ±0.75 to ±18 volts**
- **Less than 15 nA bias currents**
- **Complete short-circuit protection**
- **Internally compensated**

DESCRIPTION

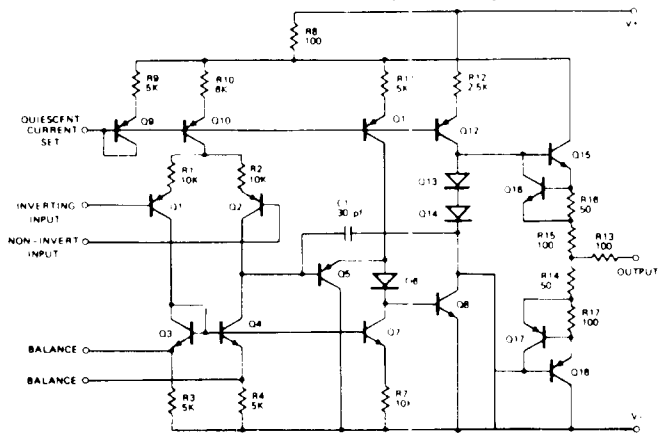
SG4250/4250C

The SG4250/4250C are intended for applications requiring extremely low internal power consumption. The device is pin compatible with the 741 type operational amplifiers and is an exact replacement for the industry standard 4250/4250C.

FEATURES

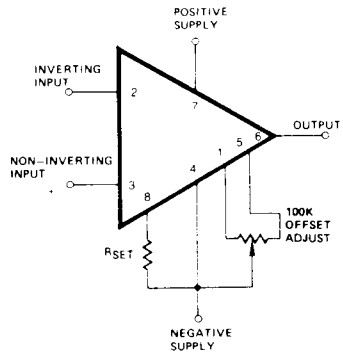
- **±1V to ±18V power supply operation**
- **W standby power consumption**
- **5nA input bias current**
- **35nV $\sqrt{Hz}$ input noise voltage (typ)**
- **Internally compensated**

SCHEMATIC DIAGRAM (Each Amplifier)



NOTE: Balance adjust not available in triple op amp

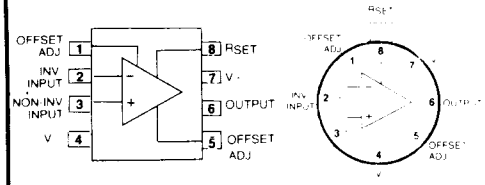
CONNECTION DIAGRAM



NOTE: R_{SET} is required to establish the internal operating currents. Its value may be determined on the table given on page 2.

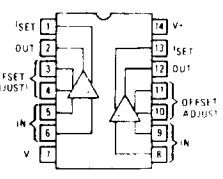
CONNECTION DIAGRAMS (Top Views)

SINGLE



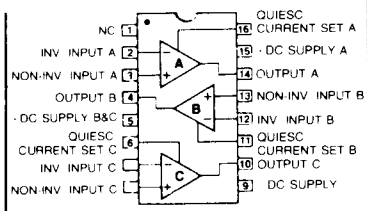
TOP VIEW
1250/2250/3250/4250/4250C

DUAL



TOP VIEW
1252/2252/3252

TRIPLE



TOP VIEW
1253/2253/3253

SG1250/SG2250/SG3250 — Single
SG1252/SG2252/SG3252 — Dual
SG1253/SG2253/SG3253 — Triple
SG4250/SG4250C — Single

ABSOLUTE MAXIMUM RATINGS

Supply Voltage	±18V
Differential Input Voltage (Note 1)	±18V
Common Mode Input Voltage (Note 2)	±18V
Output Short Circuit Duration	Indefinite (Note 3)
Power Dissipation (Pkg. Limitation)	
T-Package	680mW
Derate above 25°C	5.4mW/°C
M-Package	400mW
Derate above 25°C	4.0mW/°C
Storage Temperature Range	
T,Y Package	−65°C to +150°C
M-Package	−55°C to +125°C

Note 1. This rating applies to maximum voltage differential between input terminals. The maximum input voltage on either input terminal is limited to supply voltage up to a limit of ±15V.

Note 2. This rating limited to ±supply voltage to a maximum of ±15V.

Note 3. With the output shorted to ground or either supply. Rating applies to +125°C case temperature or +75°C ambient temperature.

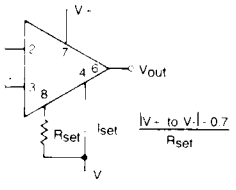
SETTING QUIESCENT CURRENT

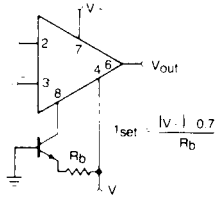
RESISTOR BIASING

Vs	QUIESCENT CURRENT			
	10μA	30μA	100μA	300μA
±1.5	1.5MΩ	470KΩ	150KΩ	- -
±3	3.3MΩ	1.1MΩ	330KΩ	100KΩ
±6	7.5MΩ	2.7MΩ	750KΩ	220KΩ
±9	13MΩ	4MΩ	1.3MΩ	350KΩ
±12	18MΩ	5.6MΩ	1.5MΩ	510KΩ
±15	22MΩ	7.5MΩ	2.2MΩ	620KΩ

CURRENT SOURCE BIASING

IQ	10μA	30μA	100μA	300μA
Iset	1.3μA	4μA	15μA	50μA





ELECTRICAL CHARACTERISTICS

PARAMETERS/CONDITIONS		1250/1252/1253[1]	2250/2252/2253[1]	3250/3252/3253[1]	4250[2]	4250C[2]	UNITS
Operating Temperature Range		−55 to +125	0 to +70	0 to +70	55 to +125	0 to +70	°C
Supply Voltage		±18					
Differential Input Voltage[3]		±15					
Common Mode Range[3]		±15					
Package Types		T,Y	T,Y,M	T,Y,M	T,Y	T,Y,M	
Input Offset Voltage	RS ≤ 100KΩ RS ≤ 10KΩ	– 3(4)	– 3(4)	– 6.0(7.5)	3(4) –	– 7.5	mV
Input Bias Current	VS = ±3V VS = ±15V	18(20) 12(15)	18(20) 12(15)	40(50) 25(30)	(15)[2]	30(50)[2]	nA
Input Offset Current		5(8)	5(8)	10(15)	(5)	10(15)	nA
Input Resistance		3	3	3	3	3	M
Large Signal Voltage Gain	RL = 10K VS = ±3V RL = 10K VS = ±15V	40(25 400(50)	40(25) 100(50)	40(25) 75(50)	– 100(50)[2]	– 75(50)[2]	V/mV
Output Voltage Swing	VS = ±3V, RL = 10KΩ VS = ±15V, RL = 10KΩ	±1.5(±1.0) ±11(±10)			– ±11(±10)[2]	– ±11[2]	V
CMRR RS ≤ 10KΩ		(70)	(70)	(70)	(70)	(70)	dB
PSRR RS ≤ 10KΩ	VS = 3V VS = ±15V	(200) (150)	(200) (150)	(200) (150)	(150)[2]	(150)[2]	μV/V
Power Consumption	VS = ±3V VS = ±15V, RL = 0	(240) (1200)	(240) (1200)	(240) (1200)	(480)[2]	(600)[2]	μW
Average TC of Offset Voltage	RS = 10K (±15V for 1250)	4(typ)	4(typ)	6(typ)	5(typ)	5(typ)	μV/°C
Average TC of Offset Current	RS = 20K (±15V for 1250)	2(typ)	2(typ)	1(typ)	1.7(typ)	1(typ)	pA/°C
Equiv. Input Noise Voltage	f=10Hz (±15V for 1250)	35(typ)	35(typ)	35(typ)	35(typ)	35(typ)	nV/√Hz
Equiv. Input Noise Current	f=10Hz (±15V for 1250)	0.5(typ)	0.5(typ)	0.5(typ)	0.5(typ)	0.5(typ)	pA/√Hz
Slew Rate	RL = 10K, CL = 100pF	0.2(typ)	0.2(typ)	0.2(typ)	0.16(typ)	0.16(typ)	V/μS
Small Signal Unity Gain-Bandwidth	Rf = 0 Vin = 20mV, RL = 20KΩ	-	–	–	250(typ)	250(typ)	kHz

Parameters for 1250/1252/1253 are min/max limits either at TA = 25°C (or over operating temperature range if enclosed in parentheses), for supply voltage of ±3V to ±15V and for a quiescent current of 30 A established by an Rset of 1.1

Parameters for 4250/4250C are min/max limits either at T = 25°C (for over operating temperature range if enclosed in parentheses.) for supply voltage of ±6 and quiescent current of 30

Not to exceed either supply voltage