



SANYO Semiconductors

DATA SHEET

LA6510 — Monolithic Linear IC

Dual Power Operational Amplifier

Overview

The LA6510 is a dual power operational amplifier IC capable of delivering larger output currents than conventional operational amplifiers.

The LA6510 features an on-chip current limiter and provides high voltage gain and a high common-mode rejection ratio. The LA6510 is an ideal choice for power applications such as DC servos, capstan drivers, actuator drivers, programmable power supplies and high-quality audio amplifiers.

Functions

- High output current ($I_O \text{ max} = 1.0\text{A}$)
- High gain
- Equipped with current limiter pin
- Supports single power source operation

Specifications

Maximum Ratings at $T_a = 25^\circ\text{C}$

| Parameter | Symbol | Conditions | Ratings | Unit |
|-----------------------------|-------------------------------|------------|-------------|------------------|
| Maximum supply voltage | $V_{CC} / V_{EE \text{ max}}$ | | ± 18 | V |
| Differential input voltage | V_{ID} | | 30 | V |
| Common mode input voltage | V_{ICOM} | | ± 15 | V |
| Maximum output current | $I_O \text{ max}$ | | 1.0 | A |
| Allowable power dissipation | $P_d \text{ max}$ | | 2.5 | W |
| Operating temperature | T_{opr} | | -40 to +85 | $^\circ\text{C}$ |
| Storage temperature | T_{stg} | | -55 to +150 | $^\circ\text{C}$ |

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SANYO Semiconductor Co., Ltd.

TOKYO OFFICE Tokyo Bldg., 1-10, 1 Chome, Ueno, Taito-ku, TOKYO, 110-8534 JAPAN

LA6510

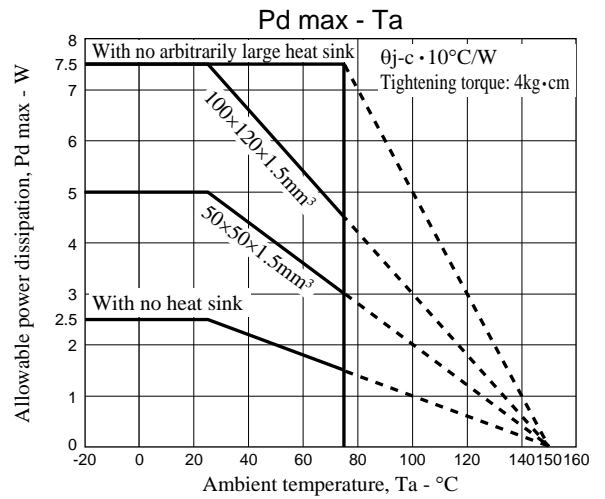
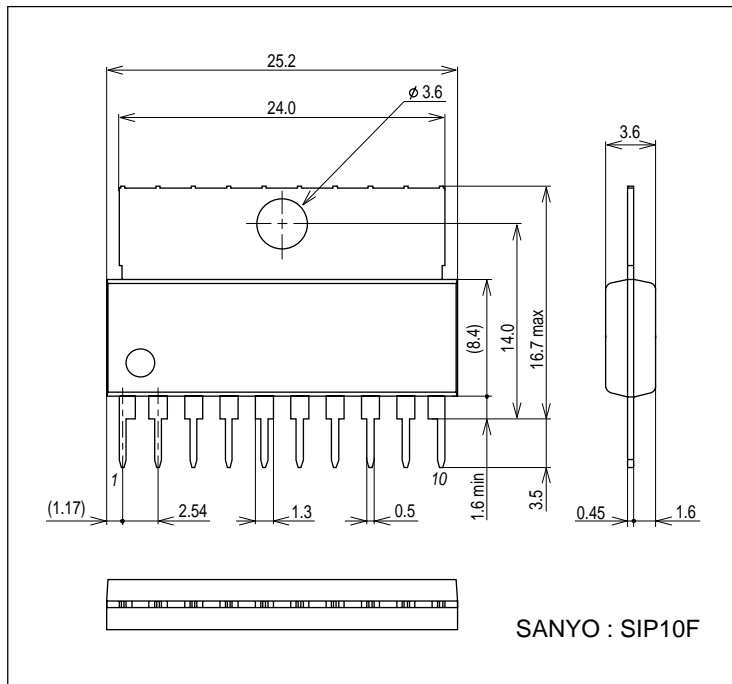
Electrical Characteristics at $T_a = 25^\circ\text{C}$, $V_{CC} / V_{EE} = \pm 15\text{V}$

| Parameter | Symbol | Conditions | Ratings | | | Unit |
|------------------------------------|-----------|-----------------------------------------------------------------------|----------|----------|-----|------------------|
| | | | min | typ | max | |
| No-load current drain | I_{CCO} | | | 12 | 20 | mA |
| Input offset voltage | V_{IO} | $R_S \leq 10\text{k}\Omega$ | | 2 | 6 | mV |
| Input offset current | I_{IO} | | | 10 | 200 | nA |
| Input bias current | I_B | | | 100 | 700 | nA |
| Common-mode input voltage range | V_{ICM} | | -15 | | +13 | V |
| Common-mode signal rejection ratio | C_{MR} | | 70 | 80 | | dB |
| Output voltage | V_O | $R_L = 33\Omega$ | ± 12 | ± 13 | | V |
| Voltage gain | V_{GO} | | | 100 | | dB |
| Slew rate | SR | $G_V = 0$, $R_L = 33\Omega$, $R = 2.2\Omega$, $C = 0.1\mu\text{F}$ | | 0.15 | | V/ μs |
| Equivalent input noise voltage | V_{NI} | $R_g = 1\text{k}\Omega$, DIN AUDIO | | 2 | | μV |
| Supply voltage rejection ratio | SVR | | | 30 | 150 | $\mu\text{V/V}$ |
| Limiting current | I_{SC} | $R_{sc} = 2.2\Omega$ | | 0.35 | | A |

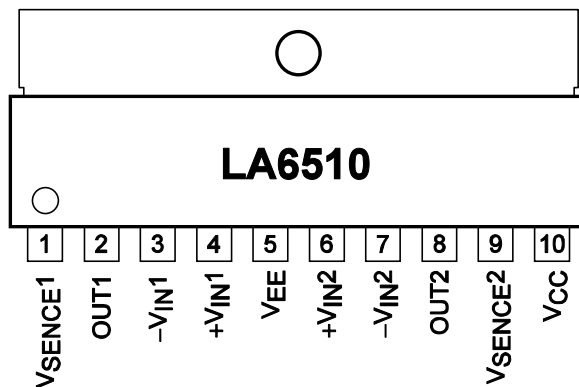
Package Dimensions

unit : mm (typ)

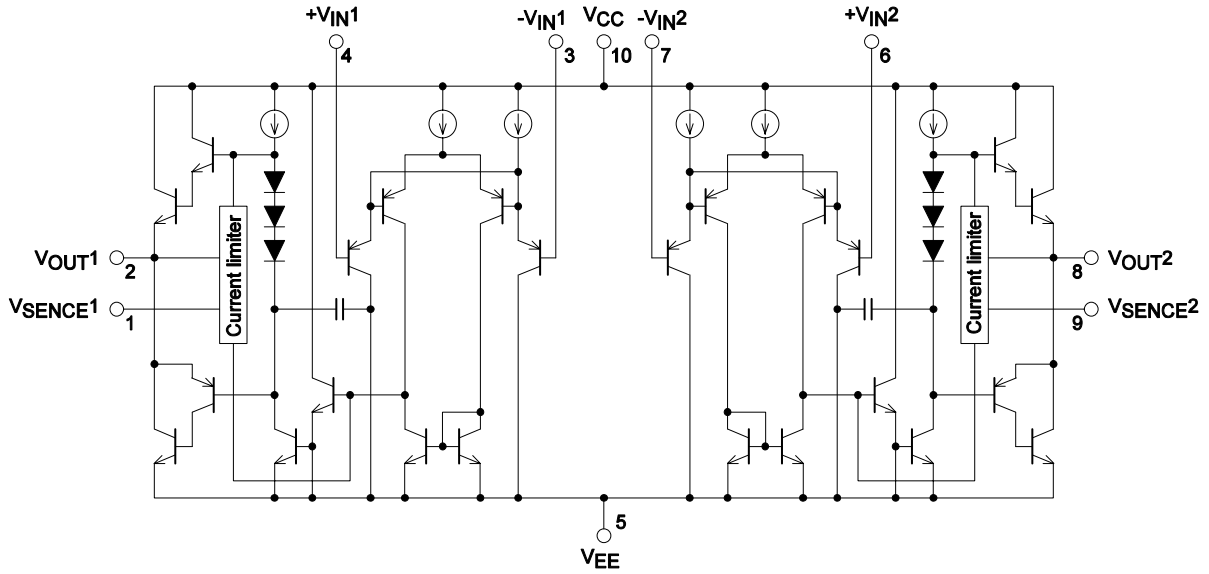
3046D



Pin Assignment

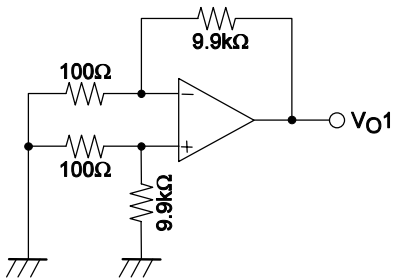


Equivalent Circuit



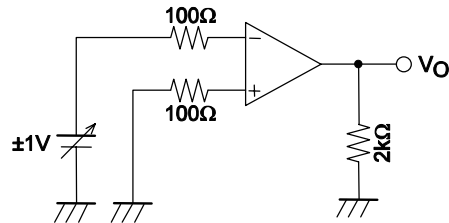
Test Circuits

- 1. Input offset voltage [V_{IO}]
Supply voltage rejection ratio [SVR]



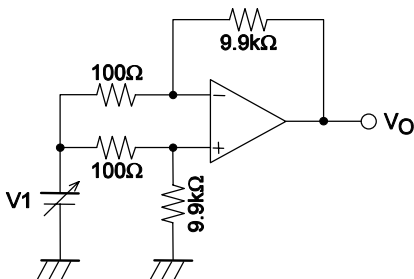
$V_{IO} \quad V_{CC} / V_{EE} = \pm 15V$
 $SVR \quad \begin{cases} V_{CC} = 15V, 5V \\ V_{EE} = -5V, -15V \end{cases}$

- 2. Output voltage [V_O]



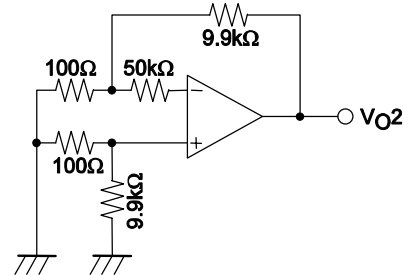
$V_{IO} = V_{O1} / 100$
 $SVR(+)$
 $SVR(-) = \left| \frac{\Delta V_{O1}}{100 \times 10V} \right|$

- 3. Common-mode signal rejection ratio [CMR]
Common-mode input voltage range [V_{ICM}]



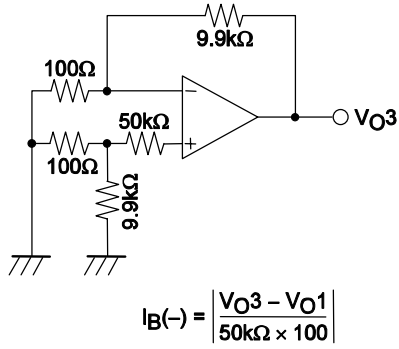
$CMR \quad V_1 = \pm 7.5V$
 $CMR = 20 \log \frac{15 \times 100}{|\Delta V_{O1}|}$

- 4. Input bias current [I_{B(+)}]

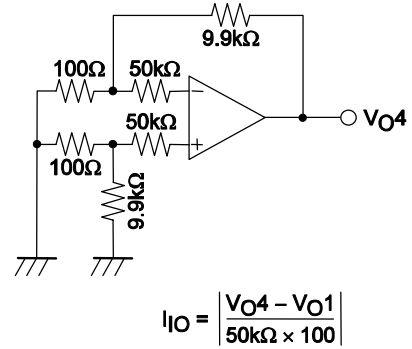


$I_{B(+)} = \frac{V_{O2} - V_{O1}}{50k\Omega \times 100}$

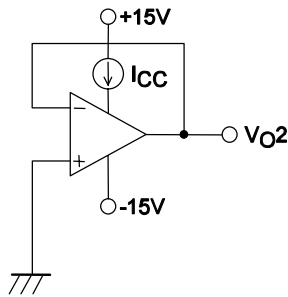
5. Input bias current [I_{B(-)}]



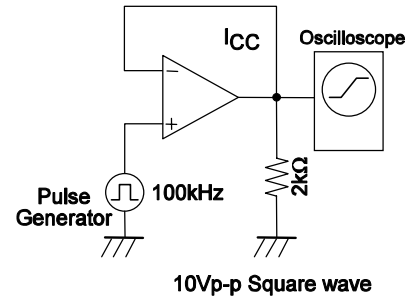
6. Input offset current [I_{IO}]



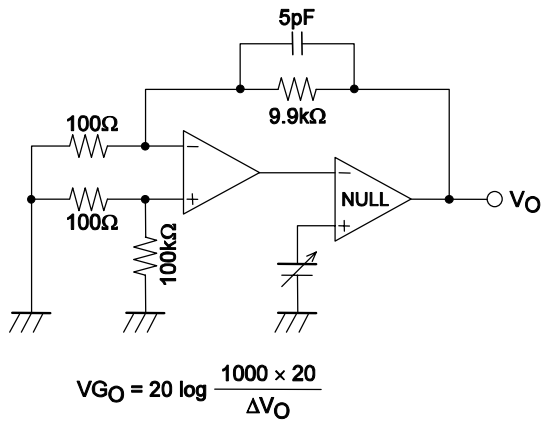
7. Current drain [I_{CC}]



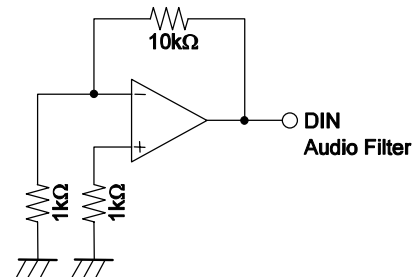
8. Slew rate [SR]



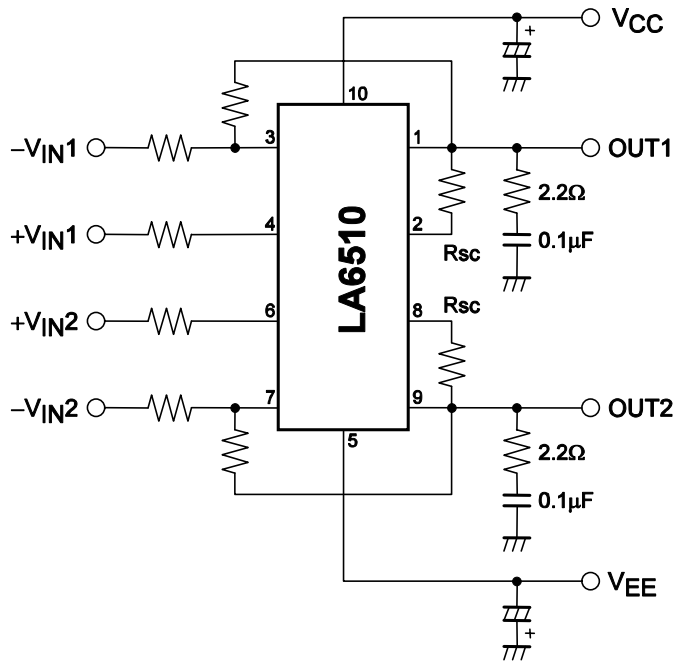
9. Voltage gain [V_{G0}]



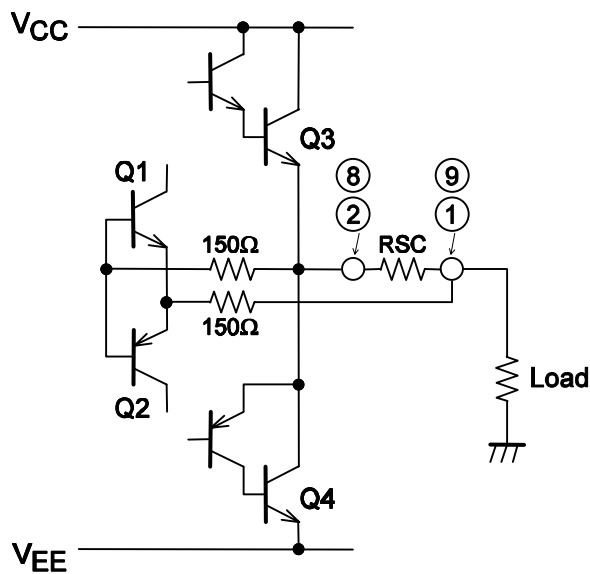
10. Equivalent input noise voltage [V_{NI}]



Application Circuit Examples



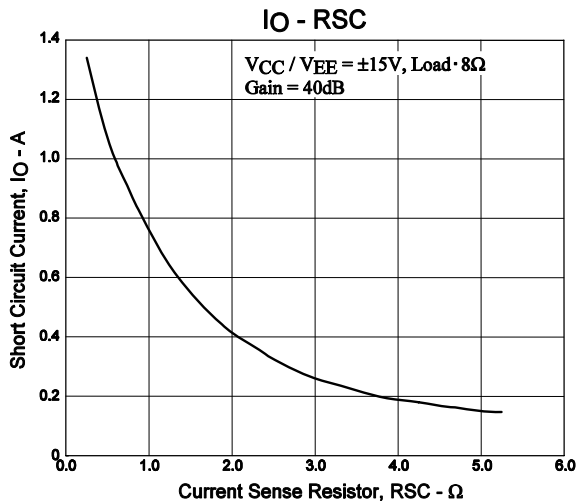
Current Limiter Circuit and Output Stage



In source mode, when Q3 turns on and current flows into the load resistor, a voltage difference occurs across RSC, turning on Q1 and activating the current limiter.

In sink mode, Q4 turns on to develop a voltage difference of the polarity opposite to that in the source mode across RSC, thus turning on Q2 and activating the limiter.

A RSC can be used to set the maximum output current, but the maximum output current will vary slightly depending on the V_{BE} temperature characteristics of the transistor.



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