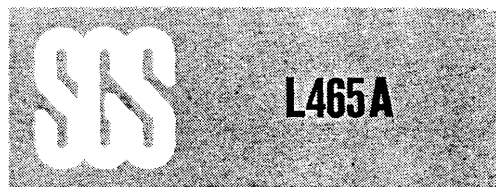


# LINEAR INTEGRATED CIRCUITS



## ADVANCE DATA

### HIGH EFFICIENCY POWER OPERATIONAL AMPLIFIER

- OUTPUT CURRENT TO 4A
- SUPPLY VOLTAGE TO  $\pm 20V$
- LARGE COMMON-MODE RANGE
- LARGE DIFFERENTIAL MODE RANGE
- LARGE BANDWIDTH
- LOW SATURATION
- SOA PROTECTION
- SHORT CIRCUIT PROTECTION
- THERMAL PROTECTION

The L465A is a monolithic integrated circuit in PENTAWATT package, intended for use as power operational amplifier in a wide range of applications, including servo amplifiers and power supplies.

The high gain and high output power capability provide superior performance wherever an operational amplifier/power booster combination is required.

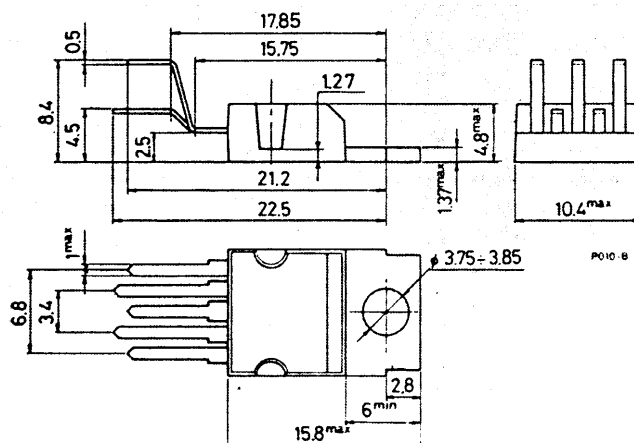
### ABSOLUTE MAXIMUM RATINGS

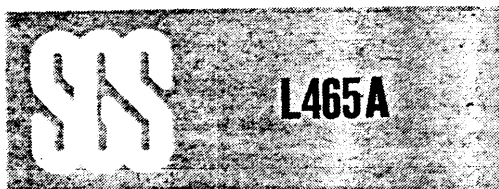
|                |                                              |            |            |
|----------------|----------------------------------------------|------------|------------|
| $V_s$          | Supply voltage                               | $\pm 20$   | V          |
| $V_i$          | Input voltage                                | $V_s$      |            |
| $V_i$          | Differential input voltage                   | $\pm 15$   | V          |
| $I_o$          | Peak output current (internally limited)     | 4          | A          |
| $P_{tot}$      | Power dissipation at $T_{case} = 90^\circ C$ | 20         | W          |
| $T_{stg}, T_j$ | Storage and junction temperature             | -40 to 150 | $^\circ C$ |

ORDERING NUMBER: L465

### MECHANICAL DATA

Dimensions in mm





## CONNECTION DIAGRAM (top view)

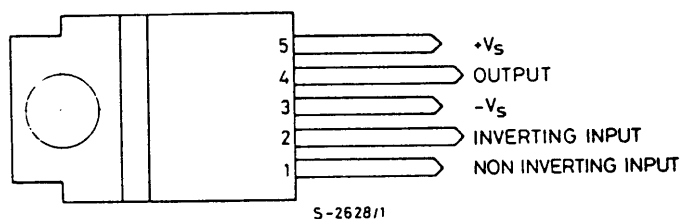


Fig. 1 - Application circuit ( $G_V > 20$  dB)

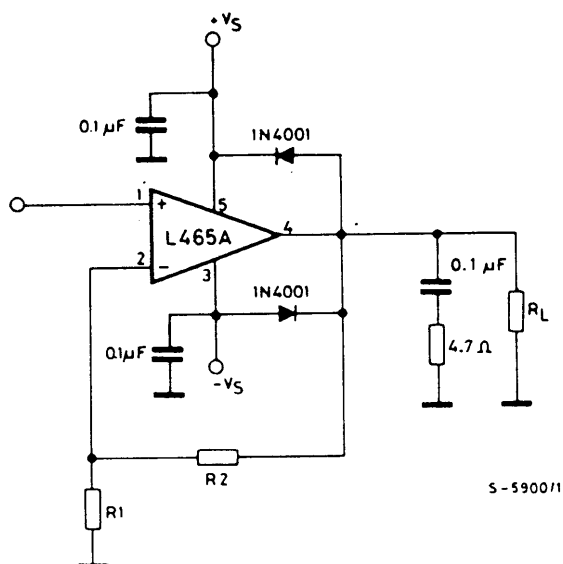
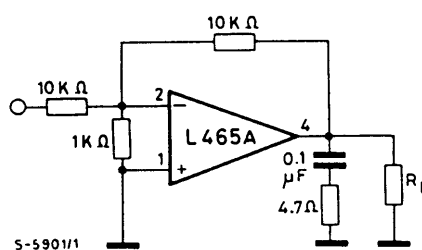
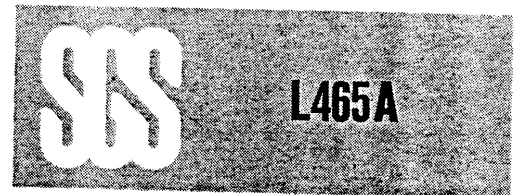


Fig. 2 - Application circuit (Unity gain)



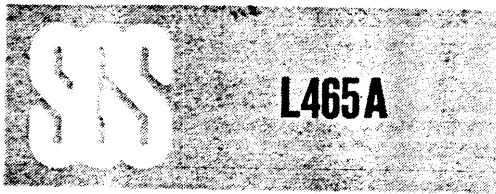


## THERMAL DATA

|                                                   |            |
|---------------------------------------------------|------------|
| $R_{th\ j-case}$ Thermal resistance junction-case | max 3 °C/W |
|---------------------------------------------------|------------|

## ELECTRICAL CHARACTERISTICS ( $V_s = \pm 15V$ , $T_{amb} = 25^\circ C$ unless otherwise specified)

| Parameter                                      | Test conditions                                                                            | Min.    | Typ.     | Max.      | Unit       |
|------------------------------------------------|--------------------------------------------------------------------------------------------|---------|----------|-----------|------------|
| $V_s$ Supply voltage                           |                                                                                            | $\pm 3$ |          | $\pm 20$  | V          |
| $I_d$ Quiescent drain current                  | $V_s \pm 18V$                                                                              |         | 45       |           | mA         |
| $I_b$ Input bias current                       |                                                                                            |         | 0.3      | 1         | $\mu A$    |
| $V_{os}$ Input offset voltage                  |                                                                                            |         | $\pm 2$  | $\pm 20$  | mV         |
| $I_{os}$ Input offset current                  |                                                                                            |         |          | $\pm 200$ | nA         |
| SR Slew-Rate                                   |                                                                                            |         | 14       |           | V/ $\mu s$ |
| $V_o$ Output voltage swing                     | $f = 1\ kHz$<br>$I_p = 0.5A$<br>$I_p = 4A$                                                 | 26      | 27<br>25 |           | Vpp        |
|                                                | $f = 10\ kHz$<br>$I_p = 0.5A$<br>$I_p = 4A$                                                |         | 27<br>24 |           | Vpp        |
| $BW$ Power bandwidth                           | $P_o = 1V$<br>$R_L = 4\Omega$                                                              |         | 100      |           | kHz        |
| $R_i$ Input resistance (pin 1)                 | $f = 1\ KHz$                                                                               | 100     | 500      |           | K $\Omega$ |
| $G_v$ Voltage gain (open loop)                 |                                                                                            |         | 80       |           | dB         |
| $e_N$ Input noise voltage                      | $B = 10\ to\ 10\ 000\ Hz$                                                                  |         | 2        | 6         | $\mu V$    |
| $i_N$ Input noise current                      |                                                                                            |         | 100      |           | pA         |
| CMR Common mode rejection                      | $R_g \leq 10\ K\Omega$<br>$G_v = 30\ dB$                                                   |         | 70       |           | dB         |
| SVR Supply voltage rejection                   | $R_g = 22\ k\Omega$<br>$V_{ripple} = 0.5\ V_{rms}$<br>$f_{ripple} = 100\ Hz$<br>$G_v = 10$ |         | 60       |           | dB         |
|                                                | $G_v = 100$                                                                                |         | 40       |           | dB         |
| $\eta$ Efficiency                              | $f = 1\ kHz$<br>$R_L = 4\Omega$<br>$I_p = 3A$                                              |         | 66       |           | %          |
| $T_{sd}$ Thermal shutdown junction temperature |                                                                                            |         | 145      |           | $^\circ C$ |



## APPLICATION INFORMATION

This circuit carries out bidirectional speed control of DC motors (fig. 3). The motor runs in one direction or in another according to whether the input voltage is higher or lower than  $V_s/2$ . The output impedance of the circuit seen by the motor is  $R_o = \frac{-2 R_4 R_1}{R_x}$  so by imposing that the equation  $R_M = R_o$  ( $R_M$  = internal resistance of motor) is checked the maximum load regulation condition is obtained. For circuit stability it should be  $R_M > |R_o|$  hence we get

$$R_x > \frac{2 R_4 \cdot R_1}{R_M}$$

The voltage available at the terminals of the motor is

$$V_M = 2 \left( V_{in} - \frac{V_s}{2} \right) + |R_o| \cdot I$$

Fig. 3 - Bidirectional speed control of DC motors

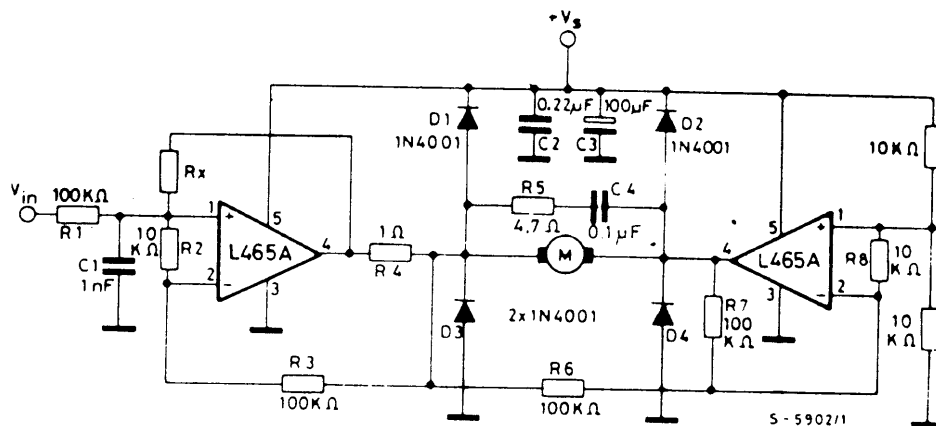
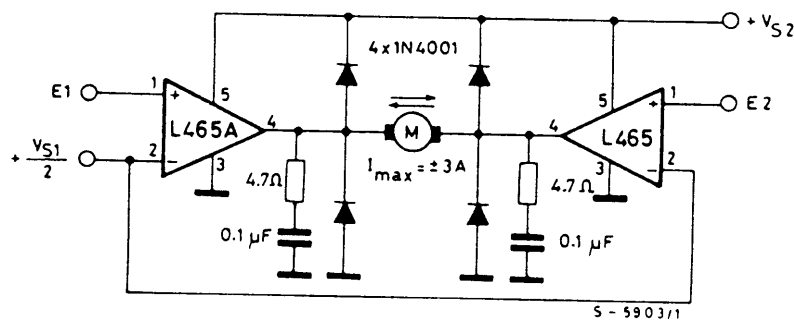


Fig. 4 - Bidirectional DC motor control with TTL/C-MOS/ $\mu$ P compatible inputs



$V_{S1}$  = logic supply voltage

Must be  $V_{S2} \geq V_{S1}$

E1, E2 = logic inputs