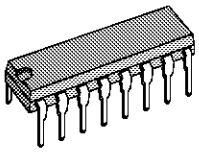
SGS-THOMSON MICROELECTRONICS

# L293B
# L293E

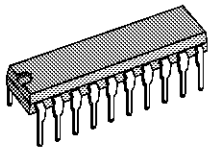
## PUSH-PULL FOUR CHANNEL DRIVERS

- OUTPUT CURRENT 1A PER CHANNEL
- PEAK OUTPUT CURRENT 2A PER CHANNEL (non repetitive)
- INHIBIT FACILITY
- HIGH NOISE IMMUNITY
- SEPARATE LOGIC SUPPLY
- OVERTEMPERATURE PROTECTION



**DIP16**

**ORDERING NUMBER :** L293B



**POWERDIP (16 + 2+ 2)**

**ORDERING NUMBER :** L293E

### DESCRIPTION

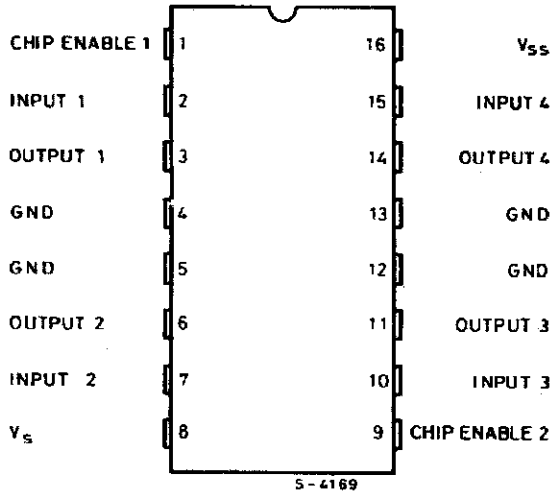
The L293B and L293E are quad push-pull drivers capable of delivering output currents to 1A per channel. Each channel is controlled by a TTL-compatible logic input and each pair of drivers (a full bridge) is equipped with an inhibit input which turns off all four transistors. A separate supply input is provided for the logic so that it may be run off a lower voltage to reduce dissipation.

Additionally, the L293E has external connection of sensing resistors, for switchmode control.

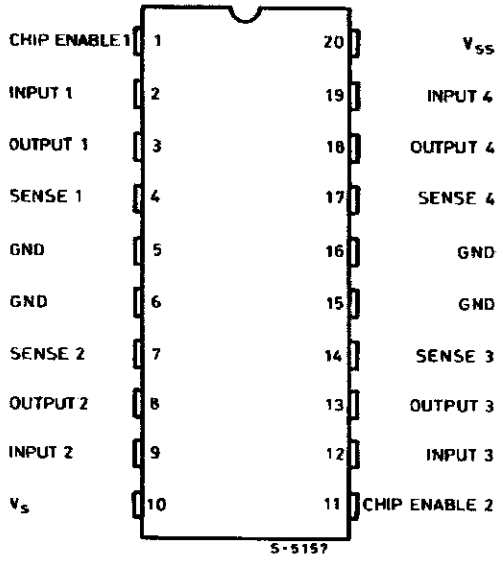
The L293B and L293E are package in 16 and 20-pin plastic DIPs respectively ; both use the four center pins to conduct heat to the printed circuit board.

### PIN CONNECTIONS

**DIP16 - L293B**

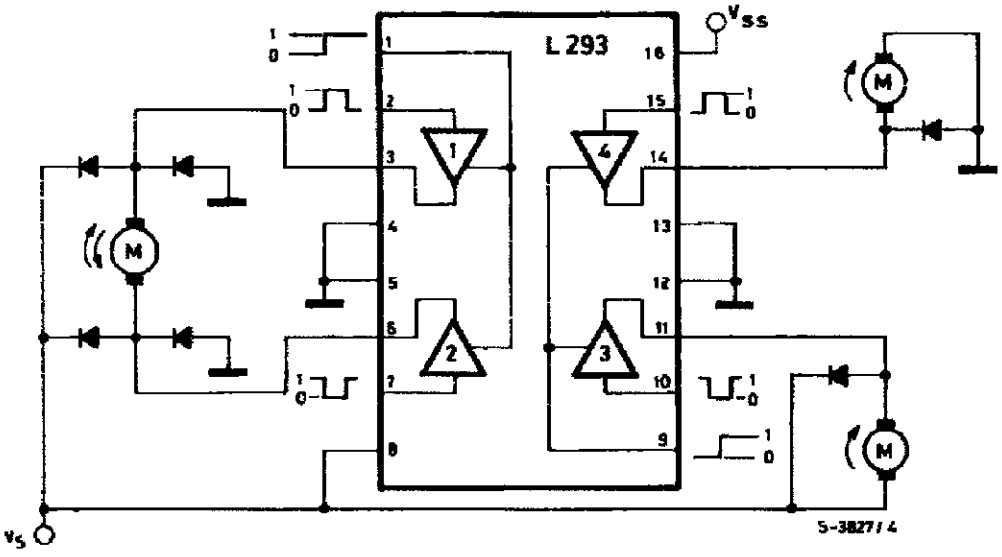



**POWERDIP (16+2+2) - L293E**

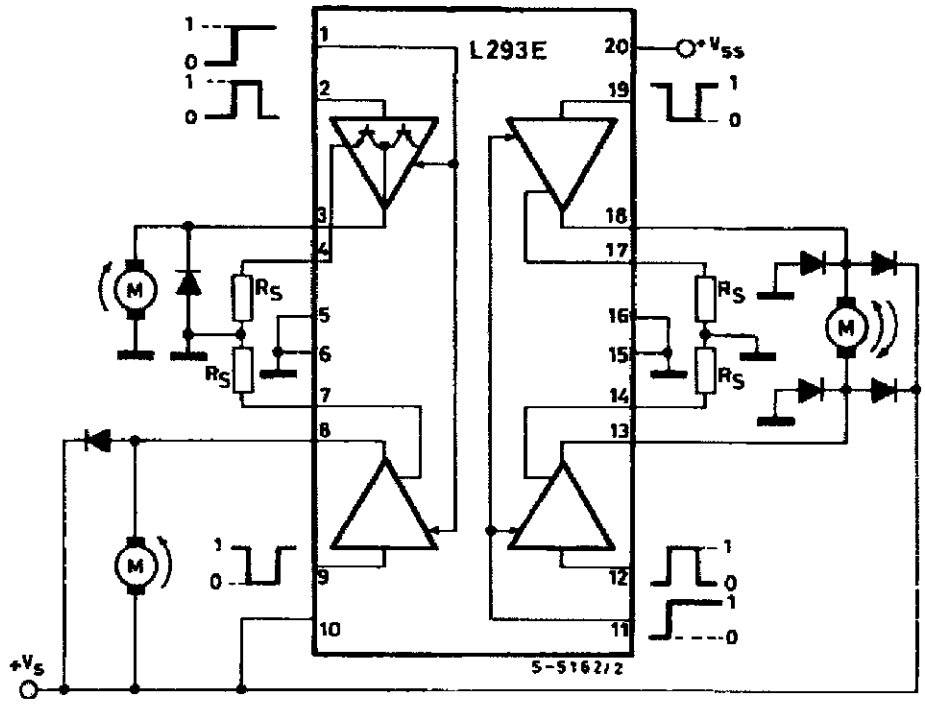


## BLOCK DIAGRAMS

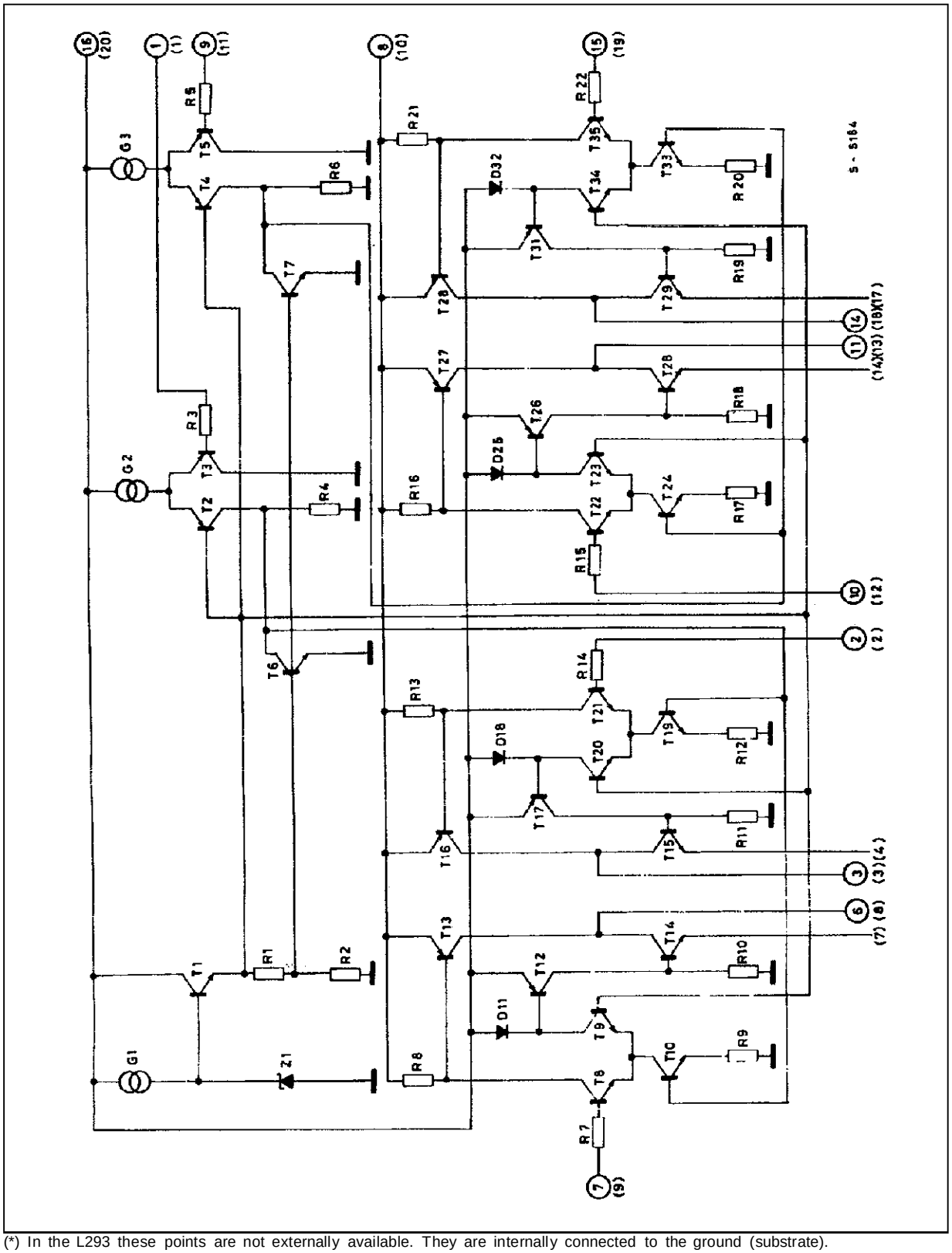
DIP16 - L293B




POWERDIP (16+2+2) - L293E



## SCHEMATIC DIAGRAM




(*) In the L293 these points are not externally available. They are internally connected to the ground (substrate).
O Pins of L293 () Pins of L293E.

## ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $V_s$ | Supply Voltage | 36 | V |
| $V_{ss}$ | Logic Supply Voltage | 36 | V |
| $V_i$ | Input Voltage | 7 | V |
| $V_{inh}$ | Inhibit Voltage | 7 | V |
| $I_{out}$ | Peak Output Current (non repetitive t = 5ms) | 2 | A |
| $P_{tot}$ | Total Power Dissipation at $T_{ground\text{-}pins}$ = 80°C | 5 | W |
| $T_{stg}$, $T_j$ | Storage and Junction Temperature | –40 to +150 | °C |

## THERMAL DATA

| Symbol | Parameter | | Value | Unit |
|---|---|---|---|---|
| $R_{th\ j\text{-}case}$ | Thermal Resistance Junction-case | Max. | 14 | °C/W |
| $R_{th\ j\text{-}amb}$ | Thermal Resistance Junction-ambient | Max. | 80 | °C/W |

## ELECTRICAL CHARACTERISTICS

For each channel, $V_S$ = 24V, $V_{SS}$ = 5V, $T_{amb}$ = 25°C, unless otherwise specified

| Symbol | Parameter | Test Conditions | Min. | TYp. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_s$ | Supply Voltage | | $V_{ss}$ | | 36 | V |
| $V_{ss}$ | Logic Supply Voltage | | 4.5 | | 36 | V |
| $I_s$ | Total Quiescent Supply Current | $V_i$ = L $I_o$ = 0 $V_{inh}$ = H<br>$V_i$ = H $I_o$ = 0 $V_{inh}$ = H<br>$V_{inh}$ = L | | 2<br>16 | 6<br>24<br>4 | mA |
| $I_{ss}$ | Total Quiescent Logic Supply Current | $V_i$ = L $I_o$ = 0 $V_{inh}$ = H<br>$V_i$ = H $I_o$ = 0 $V_{inh}$ = H<br>$V_{inh}$ = L | | 44<br>16<br>16 | 60<br>22<br>24 | mA |
| $V_{iL}$ | Input Low Voltage | | -03. | | 1.5 | V |
| $V_{iH}$ | Input High Voltage | $V_{SS} \leq 7V$<br>$V_{ss} > 7V$ | 2.3<br>2.3 | | $V_{ss}$<br>7 | V |
| $I_{iL}$ | Low Voltage Input Current | $V_{il}$ = 1.5V | | | -10 | µA |
| $I_{iH}$ | High Voltage Input Current | $2.3V \leq V_{IH} \leq V_{ss} - 0.6V$ | | 30 | 100 | µA |
| $V_{inhL}$ | Inhibit Low Voltage | | -0.3 | | 1.5 | V |
| $V_{inhH}$ | Inhibit High Voltage | $V_{SS} \leq 7V$<br>$V_{ss} > 7V$ | 2.3<br>2.3 | | $V_{ss}$<br>7 | V |
| $I_{inhL}$ | Low Voltage Inhibit Current | $V_{inhL}$ = 1.5V | | -30 | -100 | µA |
| $I_{inhH}$ | High Voltage Inhibit Current | $2.3V \leq V_{inhH} \leq V_{ss} - 0.6V$ | | | ±10 | µA |
| $V_{CEsatH}$ | Source Output Saturation Voltage | $I_o$ = -1A | | 1.4 | 1.8 | V |
| $V_{CEsatL}$ | Sink Output Saturation Voltage | $I_o$ = 1A | | 1.2 | 1.8 | V |
| $V_{SENS}$ | Sensing Voltage (pins 4, 7, 14, 17) (**) | | | | 2 | V |
| $t_r$ | Rise Time | 0.1 to 0.9 $V_o$ (*) | | 250 | | ns |
| $t_f$ | Fall Time | 0.9 to 0.1 $V_o$ (*) | | 250 | | ns |
| $t_{on}$ | Turn-on Delay | 0.5 $V_i$ to 0.5 $V_o$ (*) | | 750 | | ns |
| $t_{off}$ | Turn-off Delay | 0.5 $V_i$ to 0.5 $V_o$ (*) | | 200 | | ns |

* See figure 1
** Referred to L293E

## TRUTH TABLE

| $V_i$ (each channel) | $V_o$ | $V_{inh}$ (∞) |
|---|---|---|
| H | H | H |
| L | L | H |
| H | X (°) | L |
| L | X (°) | L |

(*) High output impedance
(**) Relative to the considerate channel

**Figure 1 :** Switching Timers

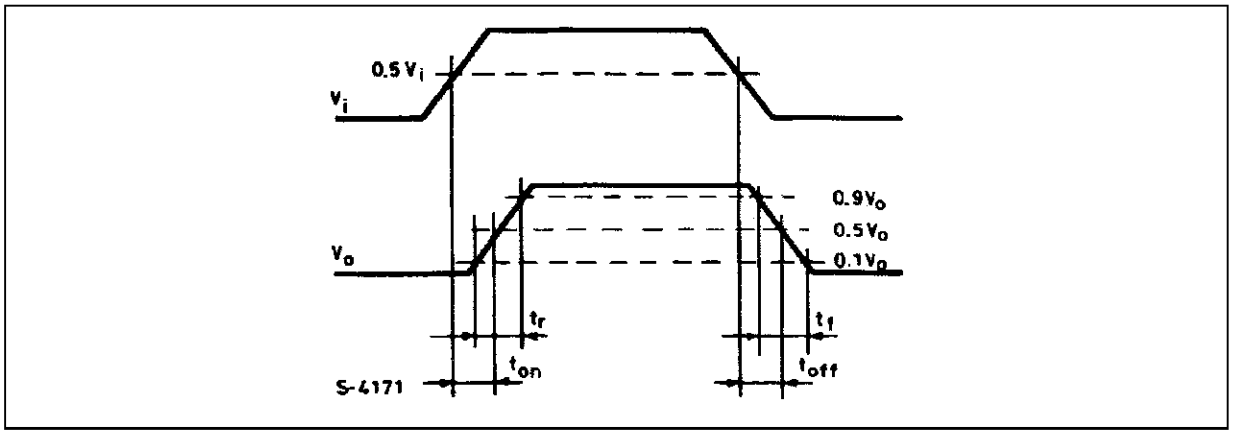



**Figure 2 :** Saturation voltage versus Output Current

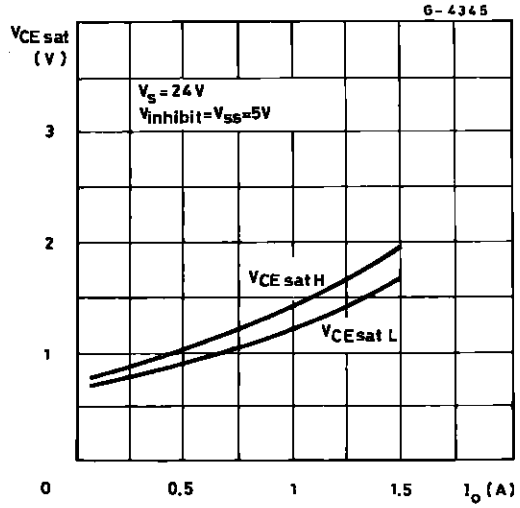



**Figure 3 :** Source Saturation Voltage versus Ambient Temperature

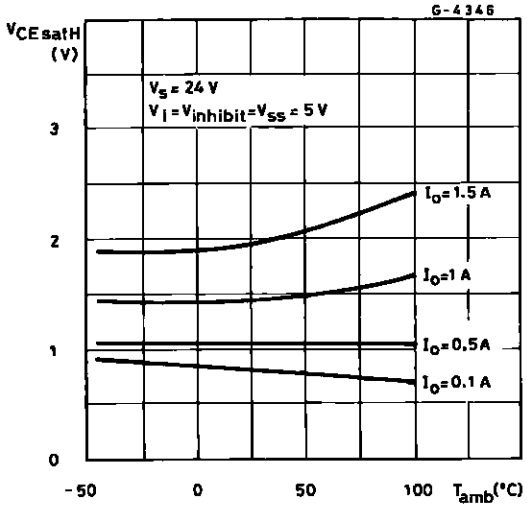



**Figure 4 :** Sink Saturation Voltage versus Ambient Temperature

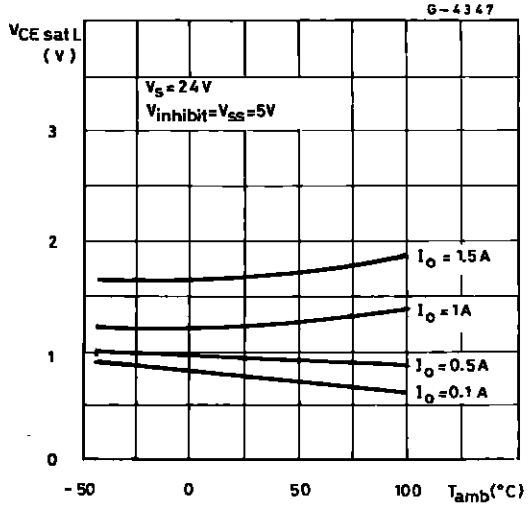



**Figure 5 :** Quiescent Logic Supply Current versus Logic Supply Voltage

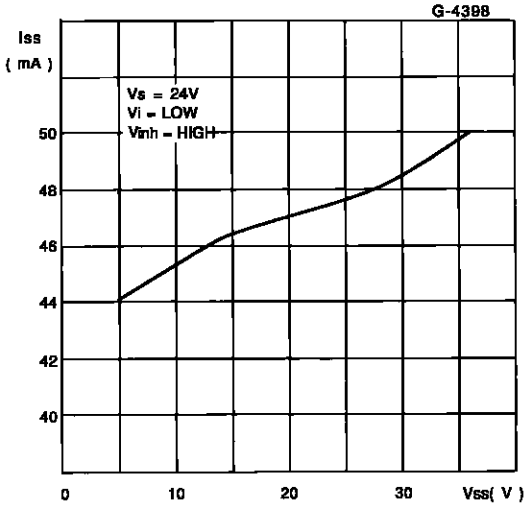


**Figure 6 :** Output Voltage versus Input Voltage

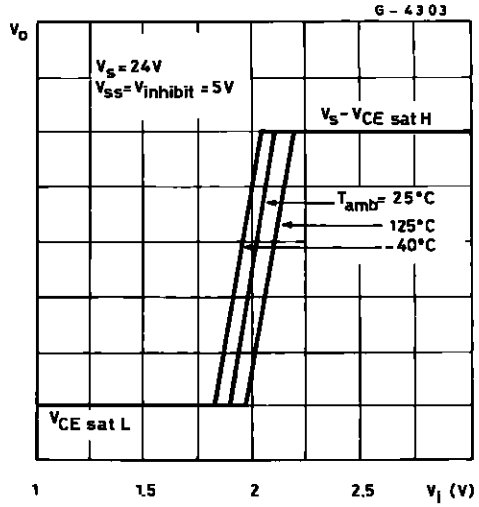
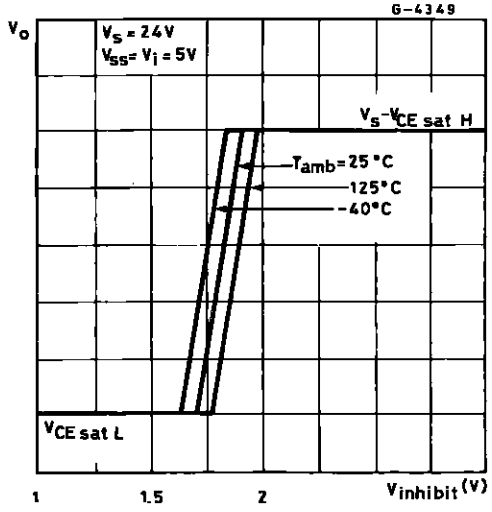
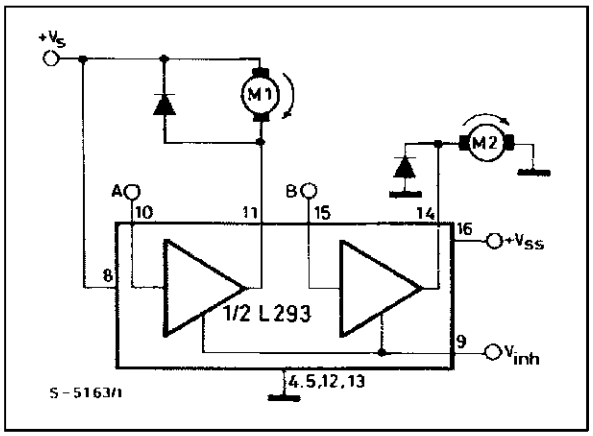



**Figure 7 :** Output Voltage versus Inhibit Voltage




## APPLICATION INFORMATION

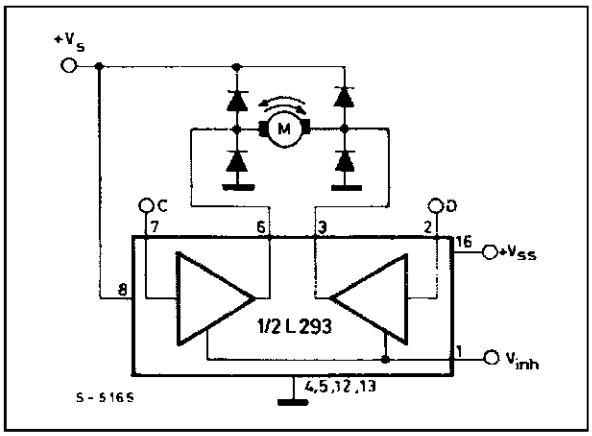
**Figure 8 :** DC Motor Controls (with connection to ground and to the supply voltage)




| $V_{inh}$ | A | M1 | B | M2 |
|---|---|---|---|---|
| H | H | Fast Motor Stop | H | Run |
| H | L | Run | L | Fast Motor Stop |
| L | X | Free Running Motor Stop | X | Free Running Motor Stop |

L = Low H = High X = Don't Care

**Figure 9 :** Bidirectional DC Motor Control




| Inputs | Function | |
|---|---|---|
| $V_{inh}$ = H | C = H ; D = L | Turn Right |
| | C = L ; D = H | Turn Left |
| | C = D | Fast Motor Stop |
| $V_{inh}$ = L | C = X ; D = X | Free Running Motor Stop |

L = Low H = High X = Don't Care

**Figure 10 :** Bipolar Stepping Motor Control

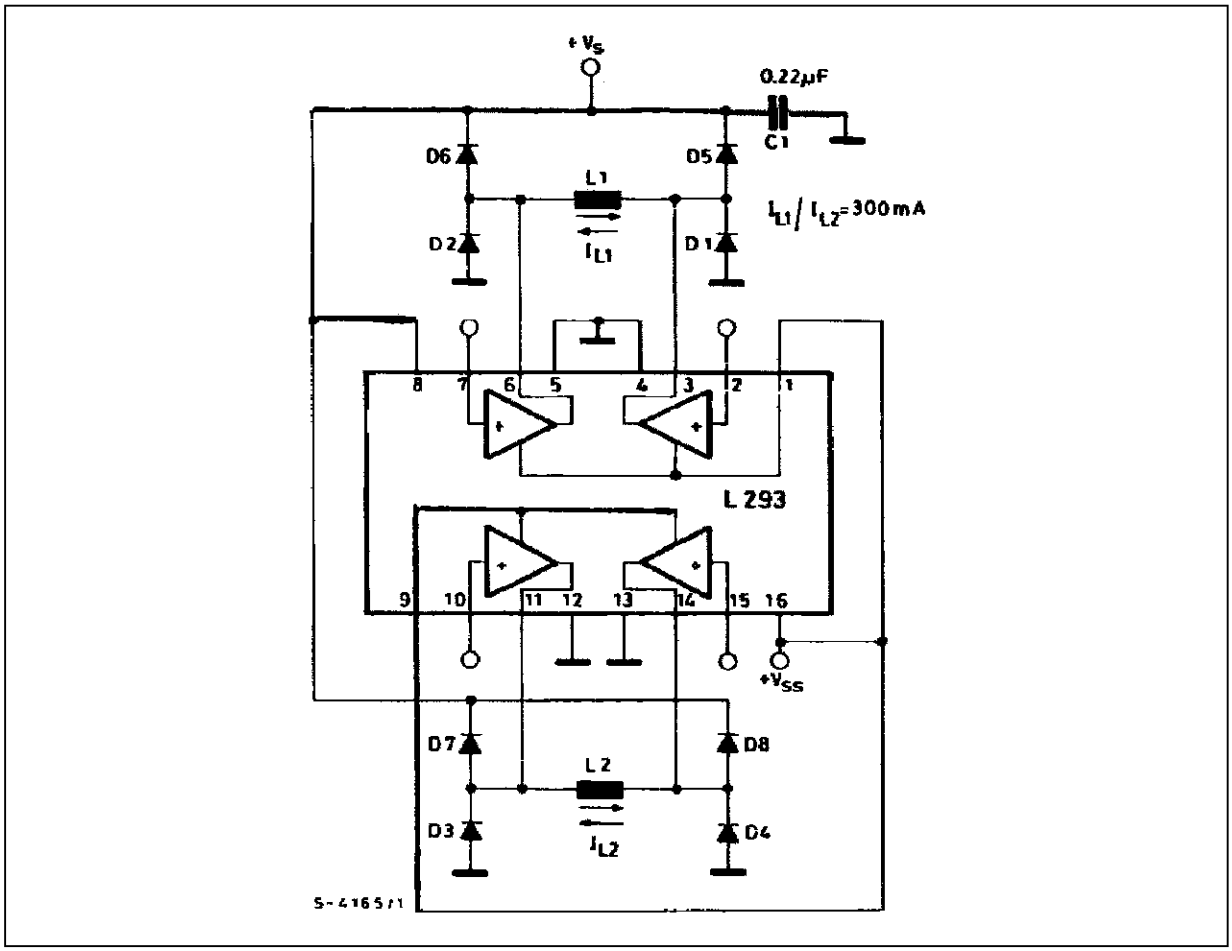
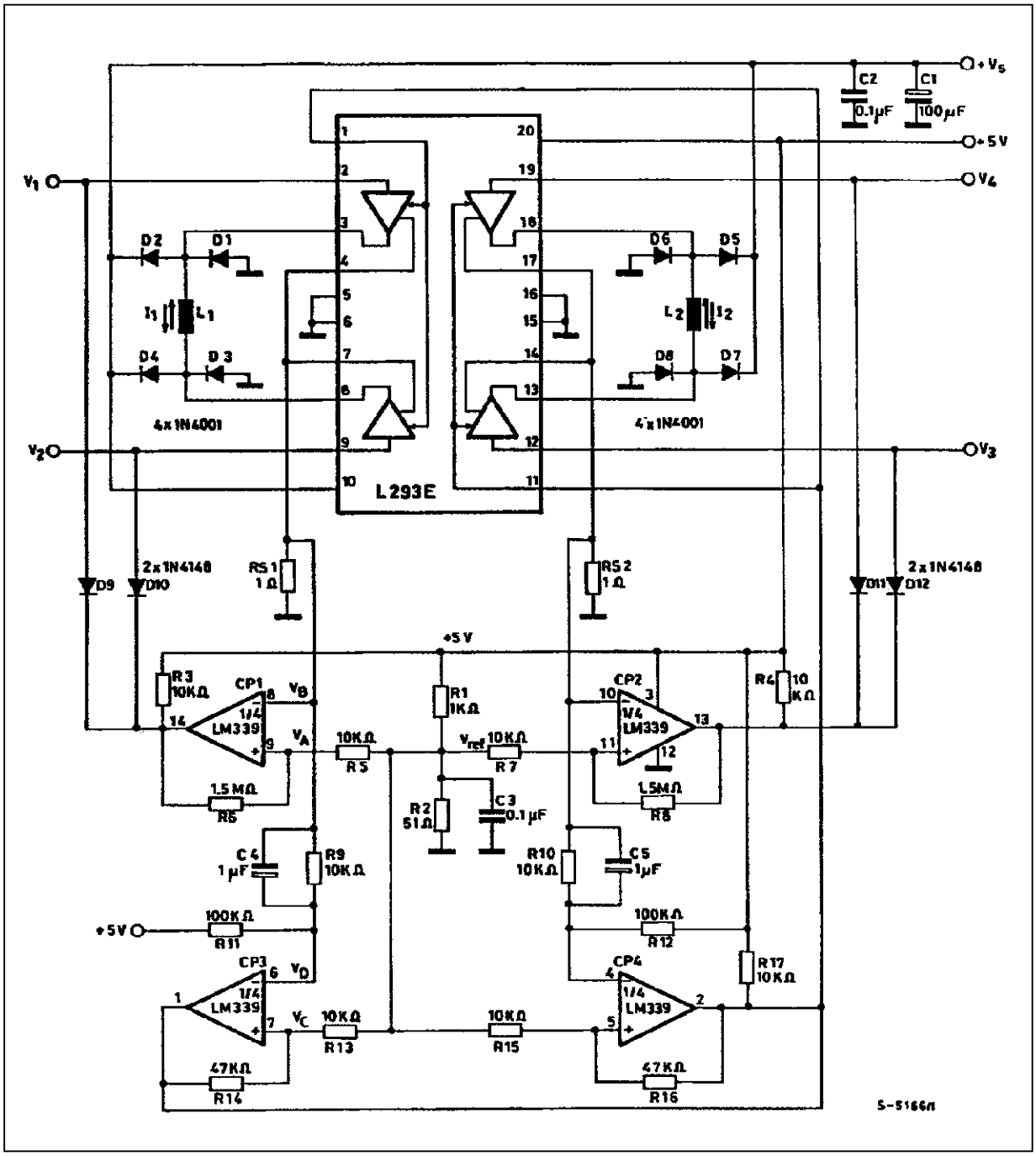


**Figure 11 :** Stepping Motor Driver with Phase Current Control and Short Circuit Protection



**MOUNTING INSTRUCTIONS**

The $R_{th\ j\text{-}amb}$ of the L293B and the L293E can be reduced by soldering the GND pins to a suitable copper area of the printed circuit board as shown in figure 12 or to an external heatsink (figure 13).

During soldering the pins temperature must not exceed 260°C and the soldering time must not be longer than 12 seconds.

The external heatsink or printed circuit copper area must be connected to electrical ground.

**Figure 12 :** Example of P.C. Board Copper Area which is Used as Heatsink

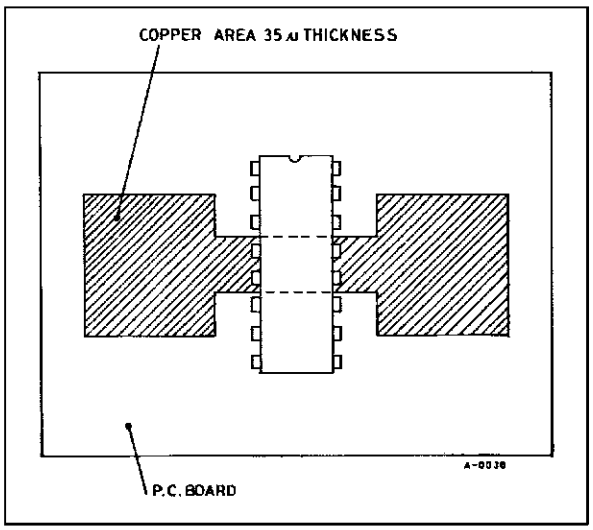
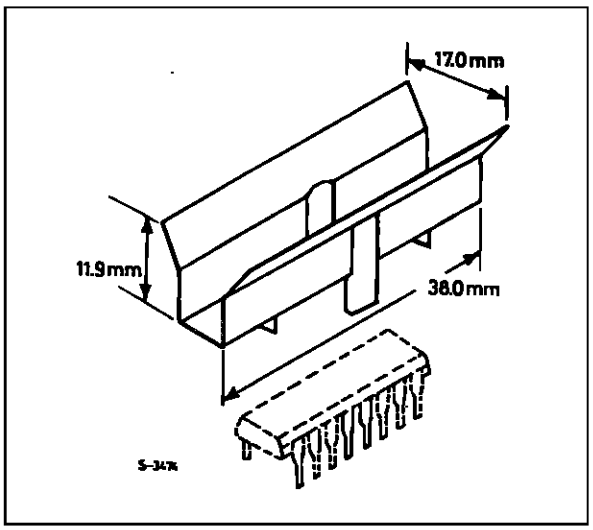


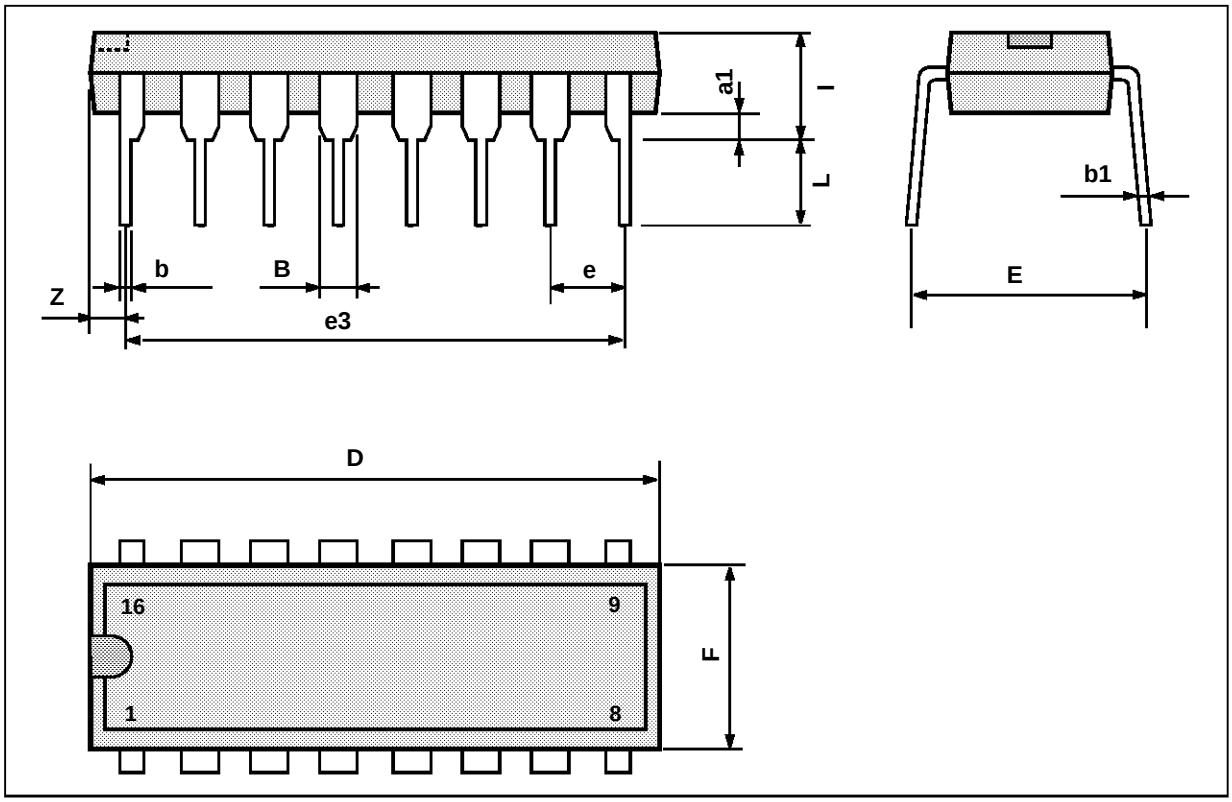

**Figure 13 :** External Heatsink Mounting Example (Rth = 30°C/W)



## DIP16 PACKAGE MECHANICAL DATA

| Dimensions | Millimeters | | | Inches | | |
|---|---|---|---|---|---|---|
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| a1 | 0.51 | | | 0.020 | | |
| B | 0.77 | | 1.65 | 0.030 | | 0.065 |
| b | | 0.5 | | | 0.020 | |
| b1 | | 0.25 | | | 0.010 | |
| D | | | 20 | | | 0.787 |
| E | | 8.5 | | | 0.335 | |
| e | | 2.54 | | | 0.100 | |
| e3 | | 17.78 | | | 0.700 | |
| F | | | 7.1 | | | 0.280 |
| i | | | 5.1 | | | 0.201 |
| L | | 3.3 | | | 0.130 | |
| Z | | | 1.27 | | | 0.050 |

DIP16PW.TBL

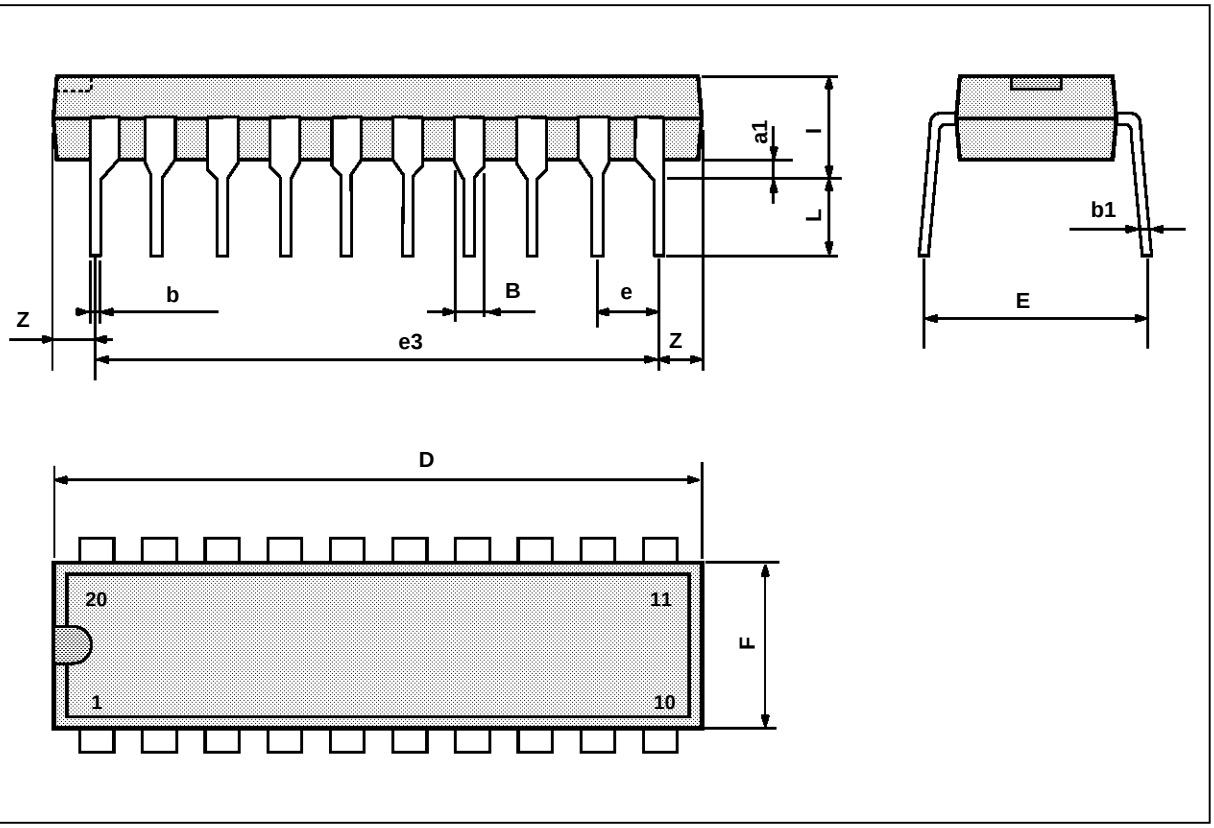



PMDIP16W.EPS

## POWERDIP (16+2+2) PACKAGE MECHANICAL DATA

| Dimensions | Millimeters | | | Inches | | |
|---|---|---|---|---|---|---|
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| a1 | 0.51 | | | 0.020 | | |
| B | 0.85 | | 1.4 | 0.033 | | 0.055 |
| b | | 0.5 | | | 0.020 | |
| b1 | 0.38 | | 0.5 | 0.015 | | 0.020 |
| D | | | 24.8 | | | 0.976 |
| E | | 8.8 | | | 0.346 | |
| e | | 2.54 | | | 0.100 | |
| e3 | | 22.86 | | | 0.900 | |
| F | | | 7.1 | | | 0.280 |
| i | | | 5.1 | | | 0.201 |
| L | | 3.3 | | | 0.130 | |
| Z | | | 1.27 | | | 0.050 |

DIP20PW.TBL




PMDIP20WEPS