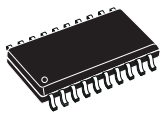
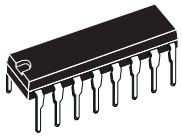
# L293D
# L293DD

## PUSH-PULL FOUR CHANNEL DRIVER WITH DIODES

- 600mA OUTPUT CURRENT CAPABILITY PER CHANNEL
- 1.2A PEAK OUTPUT CURRENT (non repetitive) PER CHANNEL
- ENABLE FACILITY
- OVERTEMPERATURE PROTECTION
- LOGICAL "0" INPUT VOLTAGE UP TO 1.5 V (HIGH NOISE IMMUNITY)
- INTERNAL CLAMP DIODES





**SO(12+4+4)** **Powerdip (12+2+2)**

**ORDERING NUMBERS:**

L293DD L293D

### DESCRIPTION

The Device is a monolithic integrated high voltage, high current four channel driver designed to accept standard DTL or TTL logic levels and drive inductive loads (such as relays solenoides, DC and stepping motors) and switching power transistors.

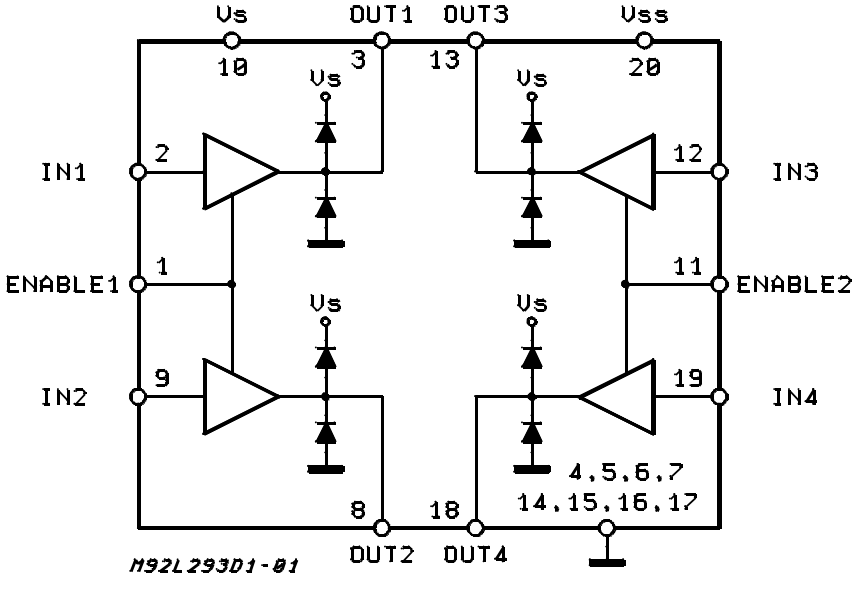
To simplify use as two bridges each pair of channels is equipped with an enable input. A separate supply input is provided for the logic, allowing operation at a lower voltage and internal clamp diodes are included.

This device is suitable for use in switching applications at frequencies up to 5 kHz.

The L293D is assembled in a 16 lead plastic packaage which has 4 center pins connected together and used for heatsinking

The L293DD is assembled in a 20 lead surface mount which has 8 center pins connected together and used for heatsinking.

### BLOCK DIAGRAM



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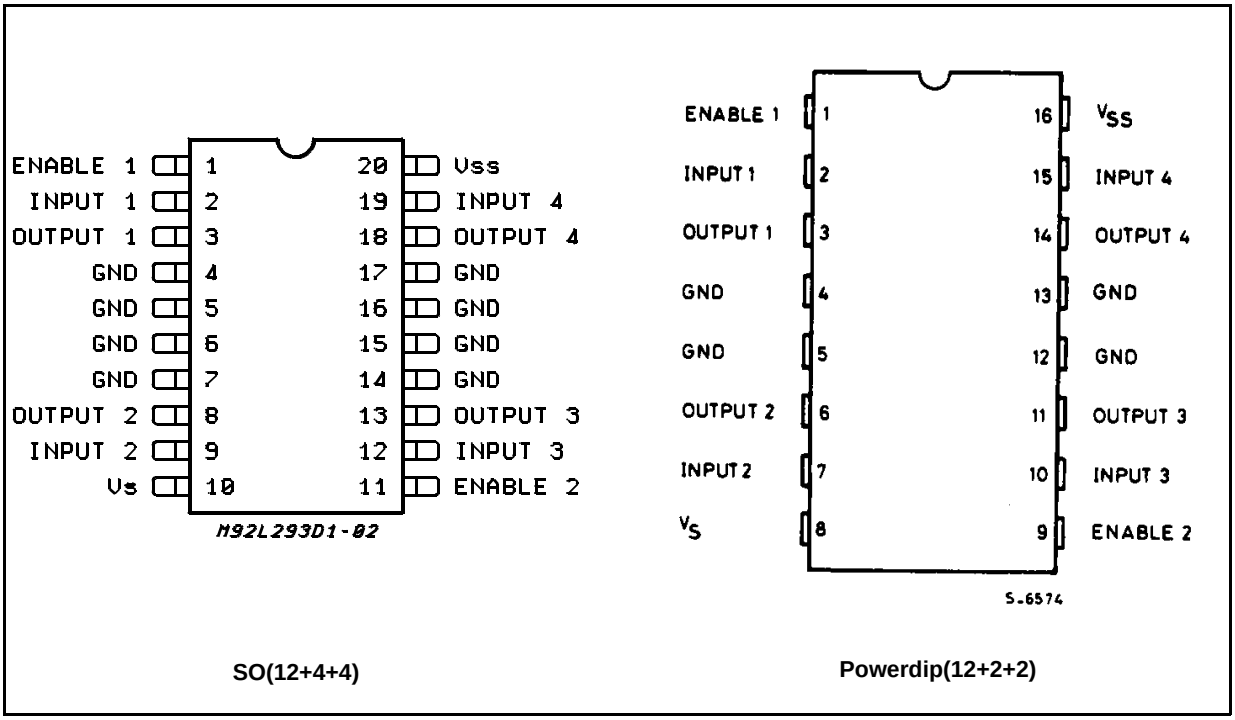
## ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $V_S$ | Supply Voltage | 36 | V |
| $V_{SS}$ | Logic Supply Voltage | 36 | V |
| $V_i$ | Input Voltage | 7 | V |
| $V_{en}$ | Enable Voltage | 7 | V |
| $I_o$ | Peak Output Current (100 µs non repetitive) | 1.2 | A |
| $P_{tot}$ | Total Power Dissipation at $T_{pins}$ = 90 °C | 4 | W |
| $T_{stg}$, $T_j$ | Storage and Junction Temperature | – 40 to 150 | °C |

## PIN CONNECTIONS (Top view)




**SO(12+4+4)** **Powerdip(12+2+2)**

## THERMAL DATA

| Symbol | Decription | | DIP | SO | Unit |
|---|---|---|---|---|---|
| $R_{th\ j\text{-}pins}$ | Thermal Resistance Junction-pins | max. | – | 14 | °C/W |
| $R_{th\ j\text{-}amb}$ | Thermal Resistance junction-ambient | max. | 80 | 50 (*) | °C/W |
| $R_{th\ j\text{-}case}$ | Thermal Resistance Junction-case | max. | 14 | – | |

(*) With 6sq. cm on board heatsink.

**ELECTRICAL CHARACTERISTICS** (for each channel, $V_S$ = 24 V, $V_{SS}$ = 5 V, $T_{amb}$ = 25 °C, unless otherwise specified)

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_S$ | Supply Voltage (pin 10) | | $V_{SS}$ | | 36 | V |
| $V_{SS}$ | Logic Supply Voltage (pin 20) | | 4.5 | | 36 | V |
| $I_S$ | Total Quiescent Supply Current (pin 10) | $V_i$ = L ; $I_O$ = 0 ; $V_{en}$ = H | | 2 | 6 | mA |
| | | $V_i$ = H ; $I_O$ = 0 ; $V_{en}$ = H | | 16 | 24 | mA |
| | | $V_{en}$ = L | | | 4 | mA |
| $I_{SS}$ | Total Quiescent Logic Supply Current (pin 20) | $V_i$ = L ; $I_O$ = 0 ; $V_{en}$ = H | | 44 | 60 | mA |
| | | $V_i$ = H ; $I_O$ = 0 ; $V_{en}$ = H | | 16 | 22 | mA |
| | | $V_{en}$ = L | | 16 | 24 | mA |
| $V_{IL}$ | Input Low Voltage (pin 2, 9, 12, 19) | | – 0.3 | | 1.5 | V |
| $V_{IH}$ | Input High Voltage (pin 2, 9, 12, 19) | $V_{SS} \leq 7$ V | 2.3 | | $V_{SS}$ | V |
| | | $V_{SS} > 7$ V | 2.3 | | 7 | V |
| $I_{IL}$ | Low Voltage Input Current (pin 2, 9, 12, 19) | $V_{IL}$ = 1.5 V | | | – 10 | µA |
| $I_{IH}$ | High Voltage Input Current (pin 2, 9, 12, 19) | 2.3 V ≤ $V_{IH}$ ≤ $V_{SS}$ – 0.6 V | | 30 | 100 | µA |
| $V_{en\ L}$ | Enable Low Voltage (pin 1, 11) | | – 0.3 | | 1.5 | V |
| $V_{en\ H}$ | Enable High Voltage (pin 1, 11) | $V_{SS} \leq 7$ V | 2.3 | | $V_{SS}$ | V |
| | | $V_{SS} > 7$ V | 2.3 | | 7 | V |
| $I_{en\ L}$ | Low Voltage Enable Current (pin 1, 11) | $V_{en\ L}$ = 1.5 V | | – 30 | – 100 | µA |
| $I_{en\ H}$ | High Voltage Enable Current (pin 1, 11) | 2.3 V ≤ $V_{en\ H}$ ≤ $V_{SS}$ – 0.6 V | | | ± 10 | µA |
| $V_{CE(sat)H}$ | Source Output Saturation Voltage (pins 3, 8, 13, 18) | $I_O$ = – 0.6 A | | 1.4 | 1.8 | V |
| $V_{CE(sat)L}$ | Sink Output Saturation Voltage (pins 3, 8, 13, 18) | $I_O$ = + 0.6 A | | 1.2 | 1.8 | V |
| $V_F$ | Clamp Diode Forward Voltage | $I_O$ = 600nA | | 1.3 | | 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 fig. 1.

### TRUTH TABLE (one channel)

| Input | Enable (*) | Output |
|---|---|---|
| H | H | H |
| L | H | L |
| H | L | Z |
| L | L | Z |

Z = High output impedance
(*) Relative to the considered channel

**Figure 1:** Switching Times

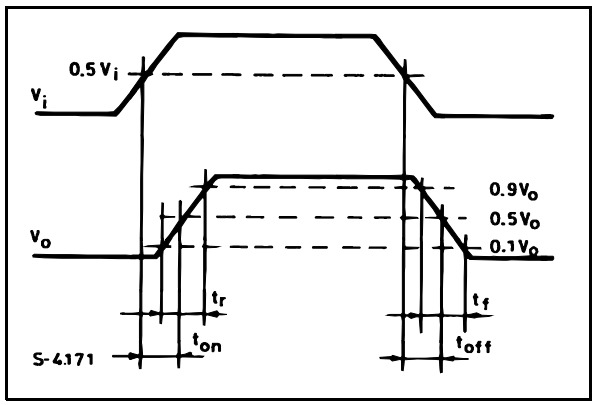
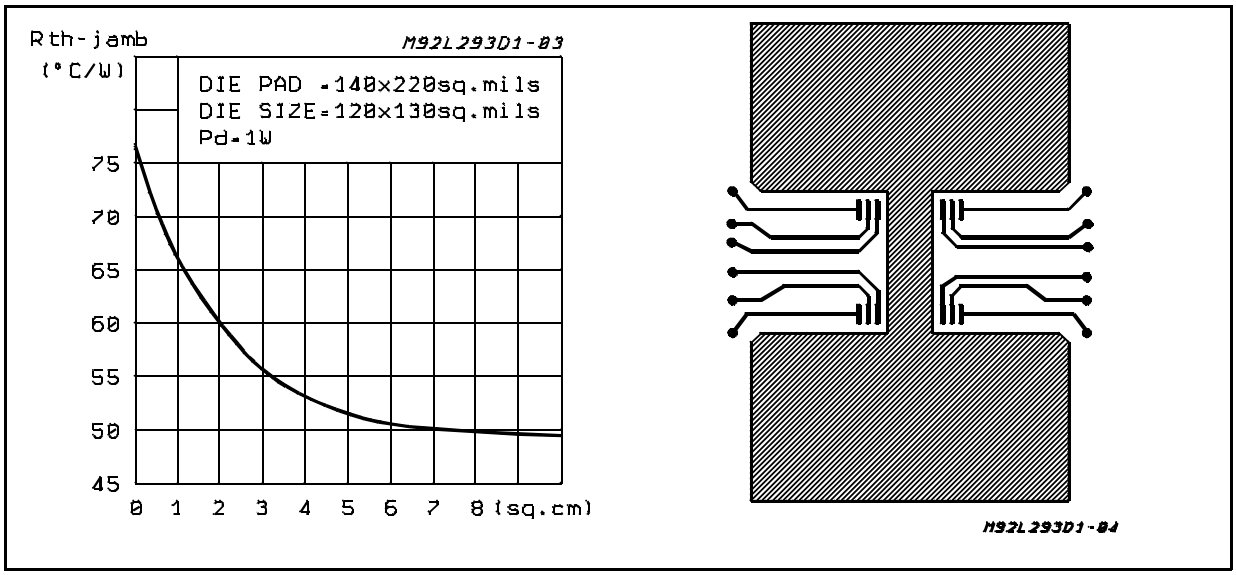
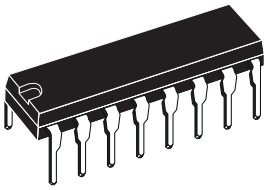



**Figure 2:** Junction to ambient thermal resistance vs. area on board heatsink (SO12+4+4 package)

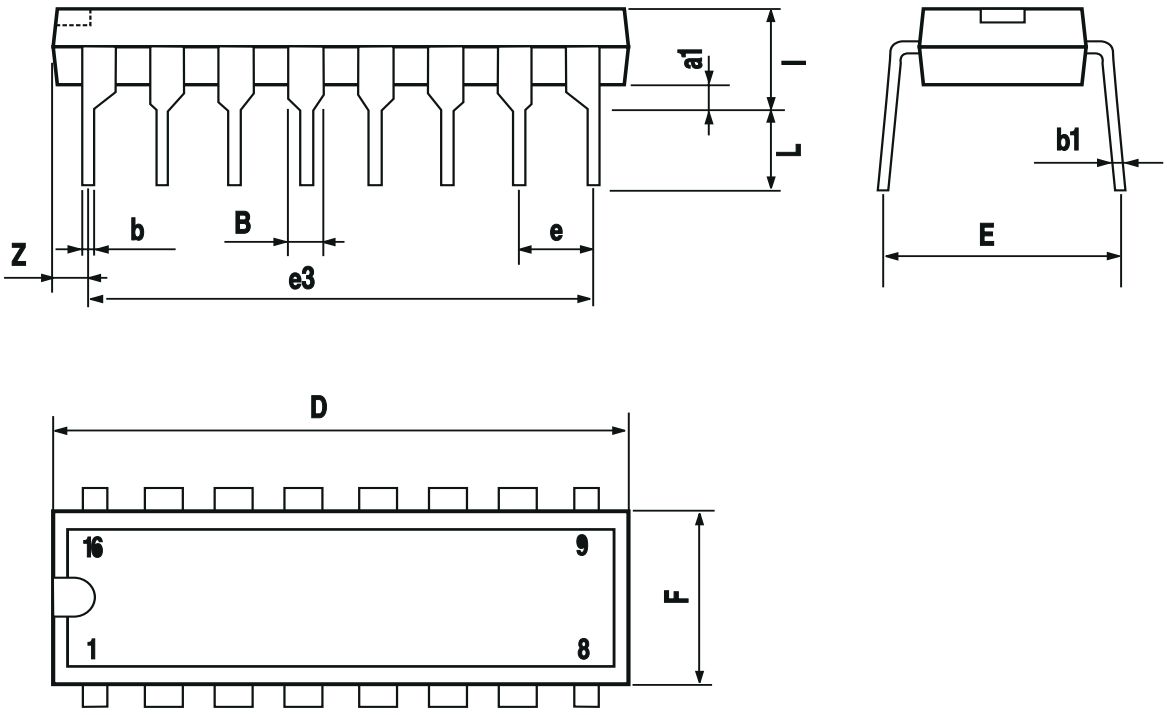


| DIM. | mm | | | inch | | |
|---|---|---|---|---|---|---|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| a1 | 0.51 | | | 0.020 | | |
| B | 0.85 | | 1.40 | 0.033 | | 0.055 |
| b | | 0.50 | | | 0.020 | |
| b1 | 0.38 | | 0.50 | 0.015 | | 0.020 |
| D | | | 20.0 | | | 0.787 |
| E | | 8.80 | | | 0.346 | |
| e | | 2.54 | | | 0.100 | |
| e3 | | 17.78 | | | 0.700 | |
| F | | | 7.10 | | | 0.280 |
| I | | | 5.10 | | | 0.201 |
| L | | 3.30 | | | 0.130 | |
| Z | | | 1.27 | | | 0.050 |

## OUTLINE AND MECHANICAL DATA

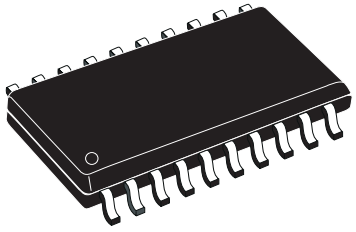


**Powerdip 16**

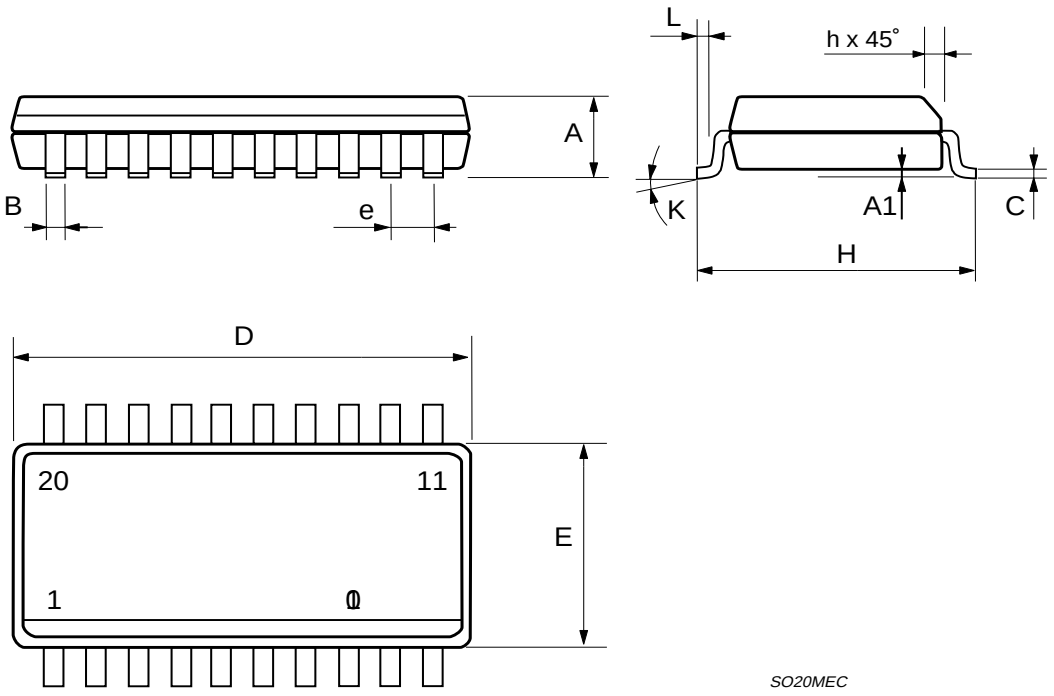


| DIM. | mm | | | inch | | |
|---|---|---|---|---|---|---|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | 2.35 | | 2.65 | 0.093 | | 0.104 |
| A1 | 0.1 | | 0.3 | 0.004 | | 0.012 |
| B | 0.33 | | 0.51 | 0.013 | | 0.020 |
| C | 0.23 | | 0.32 | 0.009 | | 0.013 |
| D | 12.6 | | 13 | 0.496 | | 0.512 |
| E | 7.4 | | 7.6 | 0.291 | | 0.299 |
| e | | 1.27 | | | 0.050 | |
| H | 10 | | 10.65 | 0.394 | | 0.419 |
| h | 0.25 | | 0.75 | 0.010 | | 0.030 |
| L | 0.4 | | 1.27 | 0.016 | | 0.050 |
| K | 0˚ (min.)8˚ (max.) | | | | | |

## OUTLINE AND MECHANICAL DATA



**SO20**



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