# ST1152B

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## Low-saturation, Low-voltage

## Bi-directional Motor Driver

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# ST1152B

## Low-saturation, Low-voltage Bi-directional Motor Driver

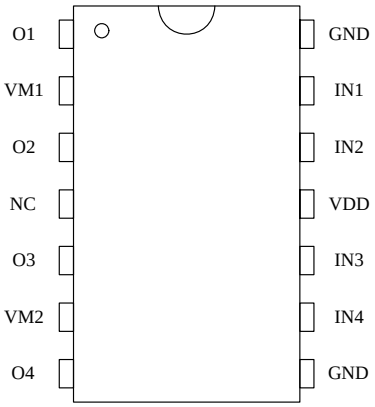
## General Specifications

The device is a two-channel low-saturation bi-directional motor driver IC. The design is optimal for stepper-motor applications, such as toy, cameras, printers or other portable devices.

## Features and Benefits

- Low voltage operation ( $V_{DD\ min}$ = $V_{S1\ min}$ = $V_{S2\ min}$ = 1.5V )
- High current output (max. 1.5A/channel)
- Built-in thermal shutdown circuit
- Built-in pull down resistor
- Low saturation voltage ( Upper transistor + low transistor residual voltage; 0.3V typ. at 400mA, 0.6V typ. at 750mA)
- Parallel connection ( two-channel driver: Upper transistor + low transistor residual ; 0.4V typ. at 800mA )
- Separate control logic power supply and motor driver power supply
- Brake function
- High output sinking and driving capability
- Thin, highly reliable package (DIP-14,SOP14)

## Pin Assignment




| Pin NO. | Pin Name | Description |
|---|---|---|
| 1 | O1 | Output sinking / driving pin |
| 2 | VM1 | Power supply pin for driver |
| 3 | O2 | Output sinking / driving pin |
| 4 | NC | No connection |
| 5 | O3 | Output sinking / driving pin |
| 6 | VM2 | Power supply pin for driver |
| 7 | O4 | Output sinking / driving pin |
| 8 | GND | Ground pin |
| 9 | IN4 | Input pin 4 that determines driving mode |
| 10 | IN3 | Input pin 3 that determines driving mode |
| 11 | VDD | Power supply pin for controller. |
| 12 | IN2 | Input pin 2 that determines driving mode |
| 13 | IN1 | Input pin 1 that determines driving mode |
| 14 | GND | Ground pin |

## Absolute Maximum Ratings *( Unless otherwise noted, $T_A$= 25℃ )*

| Characteristic | Symbol | Rating | Unit |
|---|---|---|---|
| Supply Voltage | $V_{DD}$ | 7.0 | V |
| | $V_M$ | 7.0 | V |
| Input Voltage | $V_{IN}$ | $V_{DD}$+0.4 | V |
| $I_{ODC}$ Maxium Current Per Channel (DIP14) | $I_{ODC1}$ | 1.5 | A |
| $I_{ODC}$ Maxium Current Per Channel (SOP14) | $I_{ODC2}$ | 1.3 | A |
| Power Dissipation | $P_D$ | 800 | mW |
| Operating Temperature Range | $T_{OPR}$ | -40 ~ 150 | °C |
| Storage Temperature Range | $T_{STG}$ | -65 ~ 150 | °C |

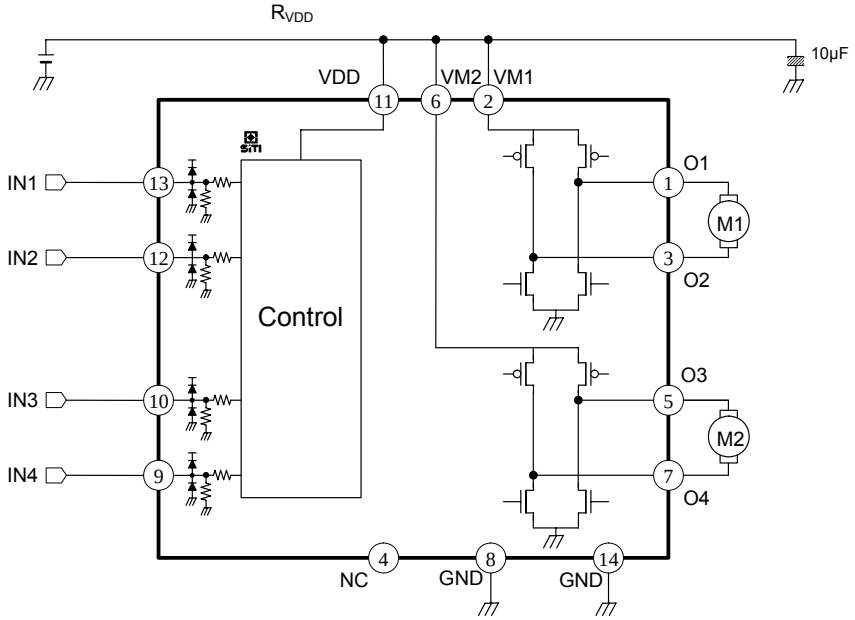
## Electrical Characteristic *(Unless otherwise noted, $T_A$= 25℃ & $V_{DD}$ = $V_M$ = 3V )*

| Characteristic | Sym. | Condition | Limit | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| Supply Voltage | $V_{DD}$ | | 1.5 | 3 | 7.0 | V |
| | $V_S$ | | 1.5 | 3 | 7.0 | V |
| Supply Current ( $I_{DD}$ + $I_S$ ) | $I_{DD0}$ | $V_{IN1, IN2, IN3, IN4}$ = 0V | | 0.1 | 10 | μA |
| | $I_{DD1}$ | $V_{IN1}$=3V, $V_{IN2, IN3, IN4}$=0V | | 0.1 | 1 | mA |
| IN1 / IN2 / IN3 / IN4 Input Terminal ( $T_J$ = 25℃) | | | | | | |
| Input Voltage “H” | $V_{IH}$ | - | 0.5*$V_{DD}$ | - | $V_{DD}$+0.4 | V |
| Input Voltage “L” | $V_{IL}$ | - | -0.4 | - | 0.2*$V_{DD}$ | V |
| Input Current “H” | $I_{IH}$ | $V_{IN}$ = $V_{DD}$=3V | 30 | 50 | 70 | μA |
| Input Current “L” | $I_{IL}$ | $V_{IN}$ = 0 V | - | - | ±5 | μA |
| O1 / O2 / O3 / O4 Output Terminal ( $T_J$ = 25℃) | | | | | | |
| Output Voltage (upper + lower) | $V_{OUT1}$ | $I_{OUT}$ = 200 mA | - | 0.15 | 0.3 | V |
| | $V_{OUT2}$ | $I_{OUT}$ = 400 mA | - | 0.3 | 0.6 | V |
| | $V_{OUT3}$ | $I_{OUT}$ = 750 mA | - | 0.6 | 0.95 | V |
| | $V_{OUT4}$ | $I_{OUT}$ = 400 mA ( parallel connection ) | - | 0.2 | 0.35 | V |
| | $V_{OUT5}$ | $I_{OUT}$ = 800 mA ( parallel connection ) | - | 0.4 | 0.7 | V |
| Thermal Protection Circuit | | | | | | |
| Protection Temperature | $T_{TSD}$ | $V_{EN}$ =VDD | | 150 | | ℃ |

## Truth Table

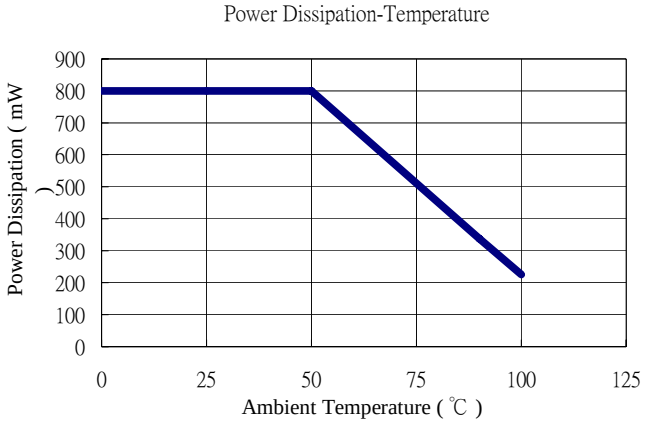
| IN1 / IN3 | IN2 / IN4 | O1 / O3 | O2 / O4 | Mode |
|---|---|---|---|---|
| H | L | H | L | Forward |
| L | H | L | H | Reverse |
| H | H | H | H | Brake |
| L | L | OFF | OFF | Standby |

## Block Diagram & Application Circuit



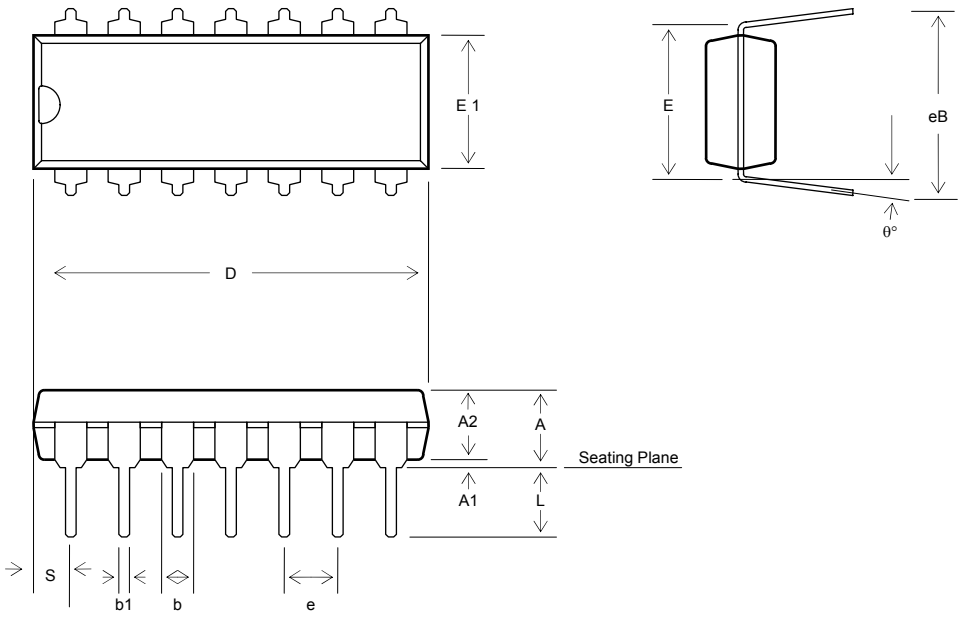
## Application Notes

- The power dissipated by the IC varies widely with the supply voltage, the output current, and loading. It is important to ensure the application does not exceed the allowable power dissipation of the IC package. The recommended motor driver power dissipation versus temperature is depicted as follows:



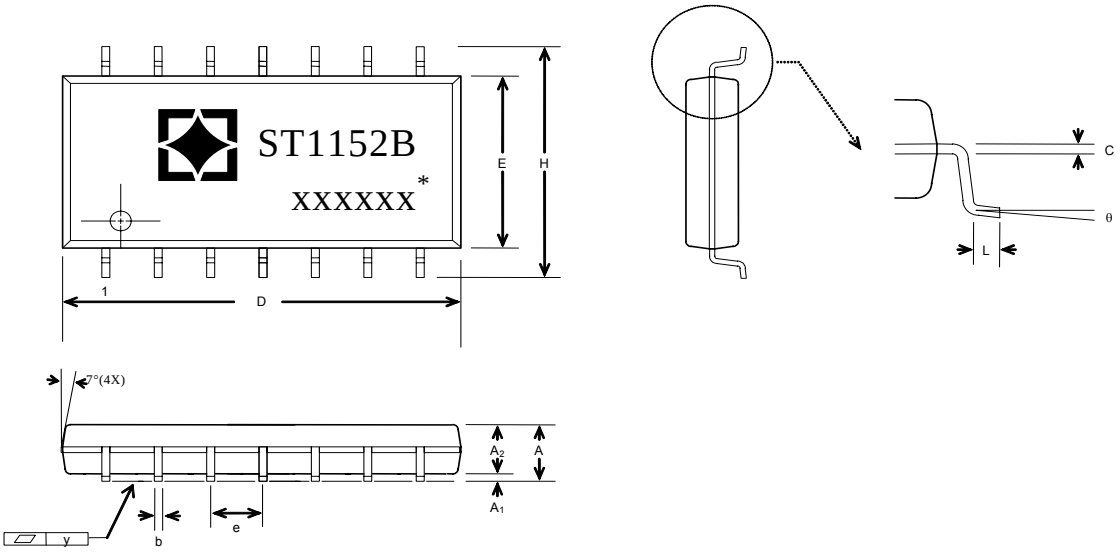
## Package Specification

( 14-pin DIP )




| SYMBOL | DIMENSION (mm) | | |
|---|---|---|---|
| | MIN. | NOM. | MAX. |
| A | | | 5.334 |
| A1 | 0.381 | | |
| A2 | 3.175 | 3.302 | 3.429 |
| b | 1.300 | 1.500 | 1.700 |
| b1 | 0.400 | 0.480 | 0.560 |
| D | 18.669 | 19.495 | 20.320 |
| E | 7.366 | 7.620 | 7.874 |
| E1 | 6.223 | 6.812 | 7.400 |
| e | 2.290 | 2.540 | 2.790 |
| eB | 8.509 | 9.017 | 9.525 |
| L | 2.540 | 3.175 | 3.810 |
| S | | | 2.390 |
| θ° | 0 | 7 | 15 |

(SOP- 14 )




| SYMBOL | Dimensions in Millimeter | | |
|---|---|---|---|
| | MIN | NOM | MAX |
| A | 1.473 | 1.626 | 1.727 |
| $A_1$ | 0.102 | – | 0.254 |
| $A_2$ | – | – | – |
| b | 0.33 | 0.406 | 0.508 |
| C | 0.191 | 0.203 | 0.249 |
| D | 8.534 | 8.661 | 8.738 |
| E | 3.810 | 3.912 | 3.988 |
| e | 1.270 BSC | | |
| H | 5.791 | 5.994 | 6.198 |
| θ | 0° | – | 8° |
| L | 0.381 | 0.635 | 1.270 |
| | | | |

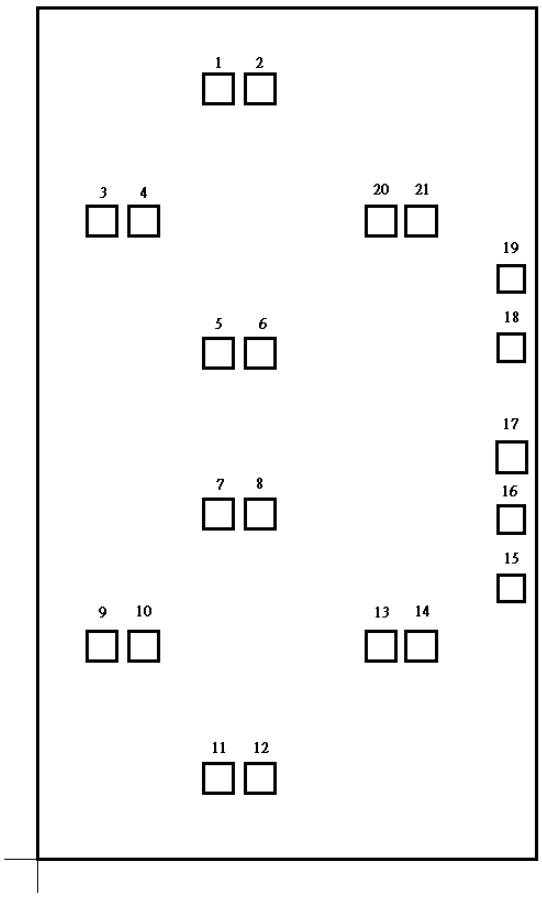
* The package marking “xxxxxx” is a lot number, and therefore being subject to change.

## Pad Windows Location

□ The following table and figure show the pad windows location in layout view.

Unit：um

| Pad NO | PAD Name | Center Coordinate (X,Y) | | PAD Size |
|---|---|---|---|---|
| 1 | O1 | 544 | 2309 | 90X90 |
| 2 | O1 | 669 | 2309 | 90X90 |
| 3 | VM1 | 193 | 1912 | 90X90 |
| 4 | VM1 | 318 | 1912 | 90X90 |
| 5 | O2 | 544 | 1516 | 90X90 |
| 6 | O2 | 669 | 1516 | 90X90 |
| 7 | O3 | 544 | 1035 | 90X90 |
| 8 | O3 | 669 | 1035 | 90X90 |
| 9 | VM2 | 193 | 639 | 90X90 |
| 10 | VM2 | 318 | 639 | 90X90 |
| 11 | O4 | 544 | 242 | 90X90 |
| 12 | O4 | 669 | 242 | 90X90 |
| 13 | VSS | 1033 | 639 | 90X90 |
| 14 | VSS | 1153 | 639 | 90X90 |
| 15 | IN4 | 1424 | 811 | 80X80 |
| 16 | IN3 | 1424 | 1018 | 80X80 |
| 17 | VDD | 1424 | 1204 | 90X90 |
| 18 | IN2 | 1424 | 1533 | 80X80 |
| 19 | IN1 | 1424 | 1740 | 80X80 |
| 20 | VSS | 1033 | 1912 | 90X90 |
| 21 | VSS | 1153 | 1912 | 90X90 |



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