# Buffered H-Bridge

## DESCRIPTION

The Si9986 is an integrated, buffered H-bridge with TTL compatible inputs and the capability of delivering a continuous 1.0 A at $V_{DD}$ = 12 V (room temperature) at switching rates up to 200 kHz. Internal logic prevents the upper and lower outputs of either half-bridge from being turned on simultaneously. Unique input codes allow both outputs to be forced low (for braking) or forced to a high impedance level.

The Si9986 is available in both standard and lead (Pb)-free, 8-pin SOIC packages, specified to operate over a voltage range of 3.8 V to 13.2 V, and the commercial temperature range of 0 to 70 °C (C suffix) and the industrial temperature range of - 40 to 85 °C (D suffix).

## FEATURES

- 1.0 A H-Bridge
- 200 kHz Switching Rate
- Shoot-Through Limited
- TTL Compatible Inputs
- 3.8 to 13.2 V Operating Range
- Surface Mount Packaging

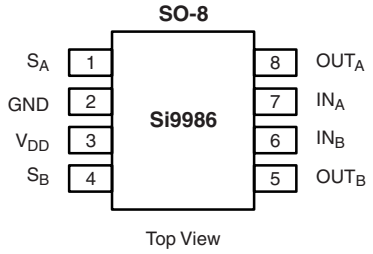
Pb-free Available

RoHS* COMPLIANT

## APPLICATIONS

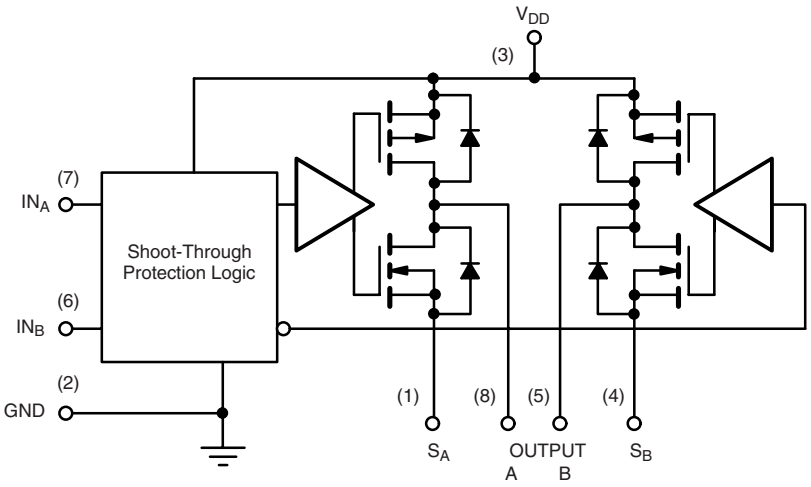
- VCM Driver
- Brushed Motor Driver
- Stepper Motor Driver
- Power Converter
- Optical Disk Drives
- Power Supplies
- High Performance Servo

## FUNCTIONAL BLOCK DIAGRAM, PIN CONFIGURATION AND TRUTH TABLE




Top View

| TRUTH TABLE | | | |
|---|---|---|---|
| $IN_A$ | $IN_B$ | $OUT_A$ | $OUT_B$ |
| 1 | 0 | 1 | 0 |
| 0 | 1 | 0 | 1 |
| 0 | 0 | 0 | 0 |
| 1 | 1 | HiZ | HiZ |




| PIN DESCRIPTION | | |
|---|---|---|
| Pin Number | Name | Function |
| 1 | $S_A$ | Source of the low-side MOSFET on bridge arm A |
| 2 | GND | Ground |
| 3 | $V_{DD}$ | IC power supply |
| 4 | $S_B$ | Source of the low-side MOSFET on bridge arm B |
| 5 | $OUT_B$ | Center tap of bridge arm B. Connects to one end of the load |
| 6 | $IN_B$ | Input signal to control bridge arm B |
| 7 | $IN_A$ | Input signal to control bridge arm A |
| 8 | $OUT_A$ | Center tap of bridge arm A. Connects to the other end of the load |

| ORDERING INFORMATION | | |
|---|---|---|
| Part Number | Temperature Range | Package |
| Si9986CY-T1 | 0 to 70 °C | Tape and Reel |
| Si9986DY-T1 | - 40 to 85 °C | |
| Si9986CY-T1-E3 | 0 to 70 °C | Lead (Pb)-free Tape and Reel |
| Si9986DY-T1-E3 | - 40 to 85 °C | |
| Si9986CY | 0 to 70 °C | Bulk (tubes) |
| Si9986DY | - 40 to 85 °C | |

* Pb containing terminations are not RoHS compliant, exemptions may apply.

## ABSOLUTE MAXIMUM RATINGS[a]

| Parameter | | Limit | Unit |
|---|---|---|---|
| Voltage on any Pin with Respect to Ground | | - 0.3 to $V_{DD}$ + 0.3 | V |
| Voltage on Pins 5, 8 with Respect to GND | | - 1 to $V_{DD}$ + 1 | |
| Voltage on Pins 1, 4 | | - 0.3 to GND + 1 | |
| Peak Output Current | | 1.5 | A |
| Storage Temperature | | - 65 to 150 | °C |
| Maximum Junction Temperature ($T_J$) | | 150 | |
| Maximum $V_{DD}$ | | 15 | V |
| Power Dissipation[b] | | 1 | W |
| $\Theta_{JA}$ | | 100 | °C/W |
| Operating Temperature Range | Si9986CY | 0 to 70 | °C |
| | Si9986DY | - 45 to 85 | |

Notes:
a. Device Mounted with all leads soldered or welded to PC board.
b. Derate 10 mW/°C above 25 °C.

*Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.*

## RECOMMENDED OPERATING RANGE

| Parameter | Limit | Unit |
|---|---|---|
| $V_{DD}$ | 3.8 to 13.2 | V |
| Maximum Junction Temperature ($T_J$) | 125 | °C |

## SPECIFICATIONS

| Parameter | Symbol | Test Conditions Unless Otherwise Specified $V_{DD}$ = 3.8 to 13.2 V, $S_A$ at GND, $S_B$ at GND | | Limits C Suffix, 0 to 70 °C D Suffix, - 40 to 85 °C Min[a] | Typ[b] | Max[a] | Unit |
|---|---|---|---|---|---|---|---|
| **Input** | | | | | | | |
| Input Voltage High | $V_{INH}$ | | | 2 | | | V |
| Input Voltage Low | $V_{INL}$ | | | | | 1 | |
| Input Current with Input Voltage High | $I_{INH}$ | $V_{IN}$ = 2 V | | | | 1 | µA |
| Input Current with Input Voltage Low | $I_{INL}$ | $V_{IN}$ = 0 V | | - 1 | | | |
| **Output** | | | | | | | |
| Output Voltage High | $V_{OUTH}$ | $I_{OUT}$ = - 500 mA | $V_{DD}$ = 10.8 V | 10.5 | 10.7 | | V |
| | | | $V_{DD}$ = 4.5 V | 4.1 | 4.3 | | |
| | | $I_{OUT}$ = - 300 mA, $V_{DD}$ = 3.8 V | | 3.4 | 3.7 | | |
| Output Voltage Low | $V_{OUTL}$ | $I_{OUT}$ = 500 mA | $V_{DD}$ = 10.8 V | | 0.2 | 0.3 | |
| | | | $V_{DD}$ = 4.5 V | | 0.2 | 0.4 | |
| | | $I_{OUT}$ = 300 mA, $V_{DD}$ = 3.8 V | | | 0.1 | 0.4 | |
| Output Leakage Current High | $I_{OLH}$ | $IN_A = IN_B \geq 2$ V, $V_{OUT} = V_{DD}$ = 13.2 V | | - 10 | 0 | | µA |
| Output Leakage Current Low | $I_{OLL}$ | $V_{OUT}$ = 0, $V_{DD}$ = 13.2 V | | | 0 | 10 | |
| Output V Clamp High | $V_{CLH}$ | $IN_A = IN_B \geq 2$ V | $I_{OUT}$ = 100 mA | | $V_{DD}$ + 0.7 | | V |
| Output V Clamp Low | $V_{CLL}$ | | $I_{OUT}$ = - 100 mA | | - 0.7 | | |
| **Supply** | | | | | | | |
| $V_{DD}$ Supply Current | $I_{DD}$ | IN = 100 kHz, $V_{DD}$ = 5 V | | | 2 | | mA |
| | | $IN_A = IN_B$ = 4.5 V, $V_{DD}$ = 5.5 V | | | | 300 | µA |
| **Dynamic** | | | | | | | |
| Propogation Delay Time | $T_{PLH}$ | $V_{DD}$ = 5 V | | | 300 | | nS |
| | $T_{PHL}$ | | | | 100 | | |

Notes:
a. The algebraic convention whereby the most negative value is a minimum and the most positive a maximum, is used in this data sheet.
b. Typical values are for DESIGN AID ONLY, not guaranteed nor subject to production testing.