

## Buffered H-Bridge

### 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

### APPLICATIONS

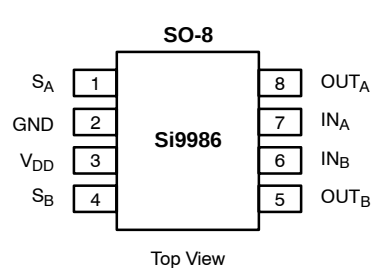
- VCM Driver
- Brushed Motor Driver
- Stepper Motor Driver
- Power Converter
- Optical Disk Drives
- Power Supplies
- High Performance Servo

### DESCRIPTION

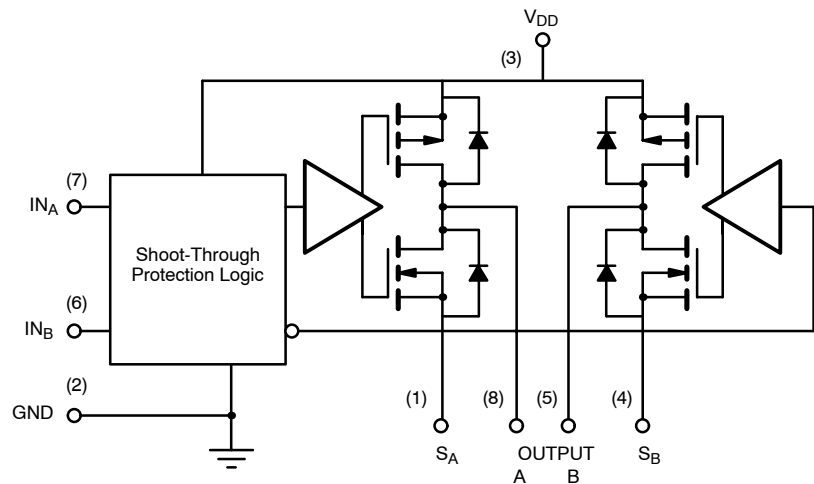
The Si9986 is an integrated, buffered H-bridge with TTL compatible inputs and the capability of delivering a continuous 1.0 A @  $V_{DD} = 12$  V (room temperature) at switching rates up to 200 kHz. Internal logic prevents the upper and lower outputs of either half-bridge from being turned on simultaneously. 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).

### FUNCTIONAL BLOCK DIAGRAM, PIN CONFIGURATION AND TRUTH TABLE



| TRUTH TABLE     |                 |                  |                  |
|-----------------|-----------------|------------------|------------------|
| IN <sub>A</sub> | IN <sub>B</sub> | OUT <sub>A</sub> | OUT <sub>B</sub> |
| 1               | 0               | 1                | 0                |
| 0               | 1               | 0                | 1                |
| 0               | 0               | 0                | 0                |
| 1               | 1               | HiZ              | HiZ              |



### 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 Free Tape and Reel |
| Si9986DY-T1—E3 | -40 to 85°C       |                         |
| Si9986CY       | 0 to 70°C         | Bulk (tubes)            |
| Si9986DY       | -40 to 85°C       |                         |

**ABSOLUTE MAXIMUM RATINGS<sup>a</sup>**

|                                           |                            |
|-------------------------------------------|----------------------------|
| Voltage on any pin with respect to ground | −0.3 V to $V_{DD} + 0.3$ V |
| Voltage on pins 5, 8 with respect to GND  | −1 V to $V_{DD} + 1$ V     |
| Voltage on pins 1, 4                      | −0.3 V to GND +1 V         |
| Peak Output Current                       | 1.5 A                      |
| Storage Temperature                       | −65 to 150°C               |
| Maximum Junction Temperature ( $T_J$ )    | 150°C                      |
| Maximum $V_{DD}$                          | 15 V                       |

|                                |             |
|--------------------------------|-------------|
| Power Dissipation <sup>b</sup> | 1 W         |
| $\theta_{JA}$                  | 100°C/W     |
| Operating Temperature Range    |             |
| Si9986CY                       | 0 to 70°C   |
| Si9986DY                       | −40 to 85°C |

**Notes**

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

**RECOMMENDED OPERATING RANGE**

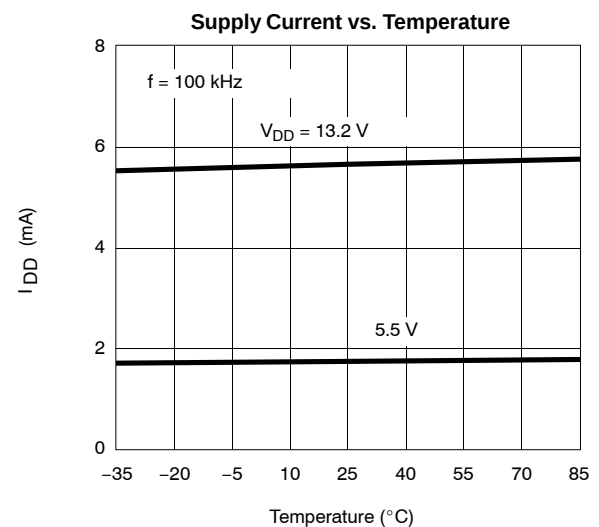
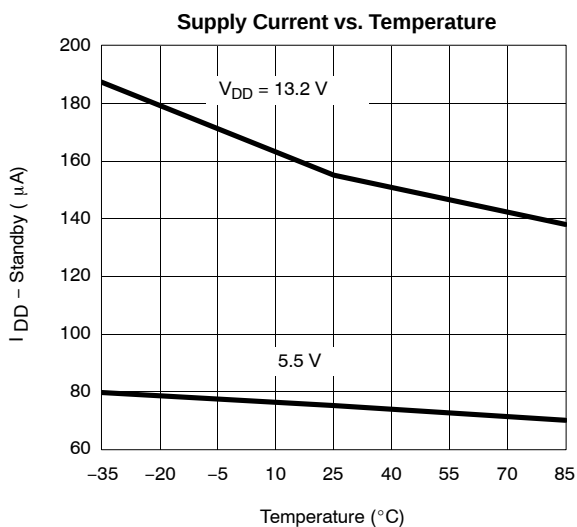
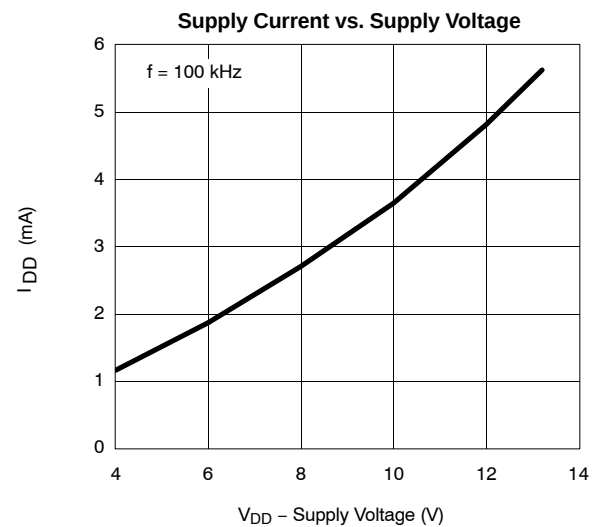
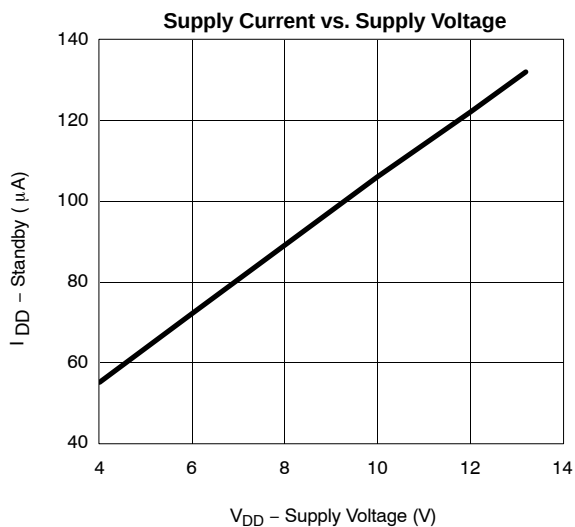
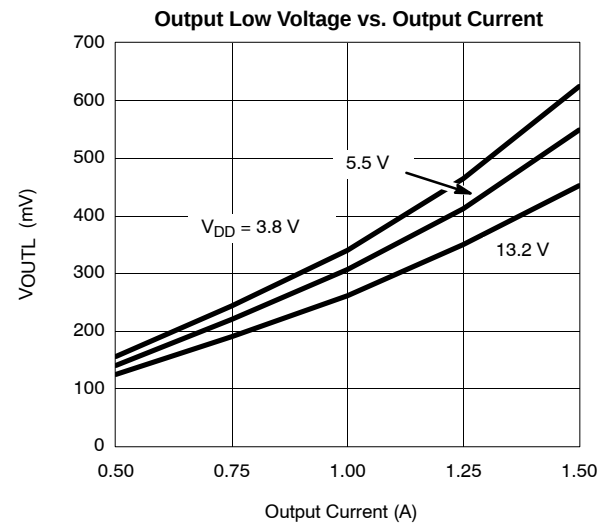
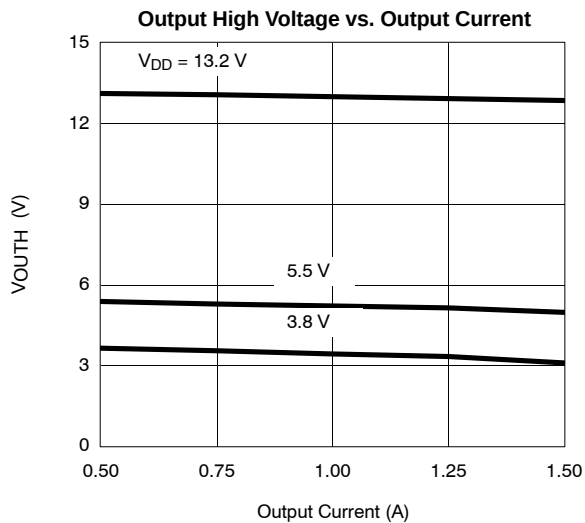
|                                        |                 |
|----------------------------------------|-----------------|
| $V_{DD}$                               | 3.8 V to 13.2 V |
| Maximum Junction Temperature ( $T_J$ ) | 125°C           |

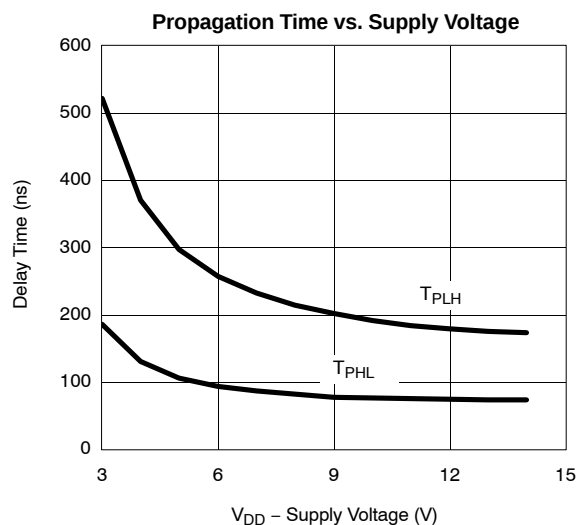
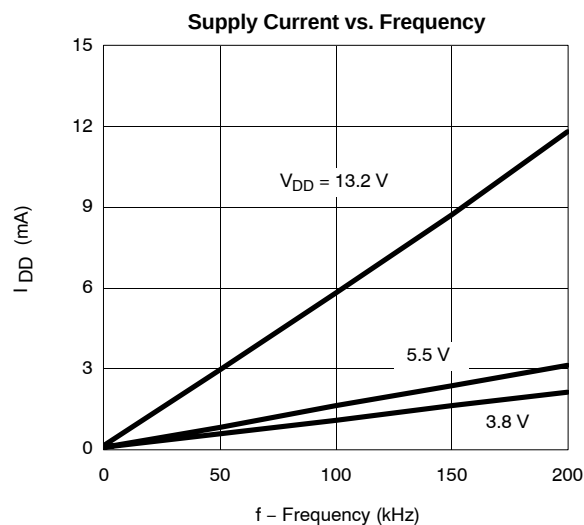
**SPECIFICATIONS**

| Parameter                             | Symbol            | Test Conditions<br>Unless Otherwise Specified<br><br>V <sub>DD</sub> = 3.8 to 13.2 V<br>S <sub>A</sub> @ GND, S <sub>B</sub> @ GND | Limits<br>C Suffix, 0 to 70°C<br>D Suffix, −40 to 85°C |                  |                      | Unit |     |
|---------------------------------------|-------------------|------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|------------------|----------------------|------|-----|
|                                       |                   |                                                                                                                                    | Min <sup>a</sup>                                       | Typ <sup>b</sup> | Max <sup>a</sup>     |      |     |
| Input                                 |                   |                                                                                                                                    |                                                        |                  |                      |      |     |
| Input Voltage High                    | V <sub>INH</sub>  |                                                                                                                                    | 2                                                      |                  |                      | V    |     |
| Input Voltage Low                     | V <sub>INL</sub>  |                                                                                                                                    |                                                        |                  | 1                    |      |     |
| Input Current with Input Voltage High | I <sub>INH</sub>  | V <sub>IN</sub> = 2 V                                                                                                              |                                                        |                  | 1                    | μA   |     |
| Input Current with Input Voltage Low  | I <sub>INL</sub>  | V <sub>IN</sub> = 0 V                                                                                                              | −1                                                     |                  |                      |      |     |
| Output                                |                   |                                                                                                                                    |                                                        |                  |                      |      |     |
| Output Voltage High                   | V <sub>OUTH</sub> | I <sub>OUT</sub> = −500 mA                                                                                                         | V <sub>DD</sub> = 10.8 V                               | 10.5             | 10.7                 | V    |     |
|                                       |                   |                                                                                                                                    | V <sub>DD</sub> = 4.5 V                                | 4.1              | 4.3                  |      |     |
|                                       |                   | I <sub>OUT</sub> = −300 mA, V <sub>DD</sub> = 3.8 V                                                                                |                                                        | 3.4              | 3.7                  |      |     |
| Output Voltage Low                    | V <sub>OUTL</sub> | I <sub>OUT</sub> = 500 mA                                                                                                          | V <sub>DD</sub> = 10.8 V                               |                  | 0.2                  |      | 0.3 |
|                                       |                   |                                                                                                                                    | V <sub>DD</sub> = 4.5 V                                |                  | 0.2                  |      | 0.4 |
|                                       |                   | I <sub>OUT</sub> = 300 mA, V <sub>DD</sub> = 3.8 V                                                                                 |                                                        |                  | 0.1                  |      | 0.4 |
| Output Leakage Current High           | I <sub>OLH</sub>  | I <sub>NA</sub> = I <sub>NB</sub> ≥ 2 V, V <sub>OUT</sub> = V <sub>DD</sub> = 13.2 V                                               |                                                        | −10              | 0                    | μA   |     |
| Output Leakage Current Low            | I <sub>OLL</sub>  | V <sub>OUT</sub> = 0, V <sub>DD</sub> = 13.2 V                                                                                     |                                                        |                  | 0                    |      | 10  |
| Output V Clamp High                   | V <sub>CLH</sub>  | I <sub>NA</sub> = I <sub>NB</sub> ≥ 2 V                                                                                            | I <sub>OUT</sub> = 100 mA                              |                  | V <sub>DD</sub> +0.7 | V    |     |
| Output V Clamp Low                    | V <sub>CLL</sub>  |                                                                                                                                    | I <sub>OUT</sub> = −100 mA                             |                  | −0.7                 |      |     |
| Supply                                |                   |                                                                                                                                    |                                                        |                  |                      |      |     |
| V <sub>DD</sub> Supply Current        | I <sub>DD</sub>   | I <sub>N</sub> = 100 kHz, V <sub>DD</sub> = 5 V                                                                                    |                                                        |                  | 2                    | mA   |     |
|                                       |                   | I <sub>NA</sub> = I <sub>NB</sub> = 4.5 V, V <sub>DD</sub> = 5.5 V                                                                 |                                                        |                  |                      | 300  | μA  |
| Dynamic                               |                   |                                                                                                                                    |                                                        |                  |                      |      |     |
| Propogation Delay Time                | T <sub>PLH</sub>  | V <sub>DD</sub> = 5 V                                                                                                              |                                                        |                  | 300                  | nS   |     |
|                                       | T <sub>PHL</sub>  |                                                                                                                                    |                                                        |                  | 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.

**TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)**

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