

## Buffered H-Bridge

### FEATURES

- 1.0-A H-Bridge
- 500-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

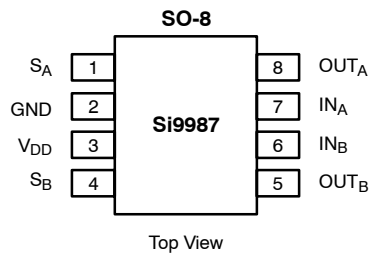
### DESCRIPTION

The Si9987 is an integrated, buffered H-bridge with TTL compatible inputs and the capability of delivering a continuous 1.0 A @  $V_{DD} = 5.0\text{ V}$  (room temperature) at switching rates up to 500 kHz. Internal logic prevents the upper and lower outputs from being turned on simultaneously. Unique input codes allow both outputs to be forced low (for braking) or

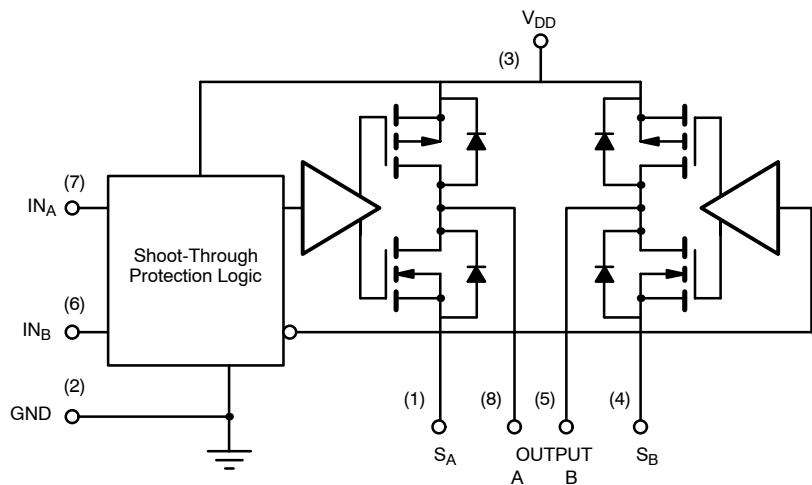
forced to a high impedance level.

The Si9987 is available in an 8-Pin SOIC package, 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 -40 to 85°C (D suffix). The Si9987 is available in lead free.

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



| <b>TRUTH TABLE</b> |                 |                  |                  |
|--------------------|-----------------|------------------|------------------|
| 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              |



| <b>ORDERING INFORMATION</b> |                   |                         |
|-----------------------------|-------------------|-------------------------|
| Part Number                 | Temperature Range | Package                 |
| Si9987CY-T1                 | 0 to 70°C         | Tape and Reel           |
| Si9987DY-T1                 | -40 to 85°C       |                         |
| Si9987CY-T1—E3              | 0 to 70°C         | Lead Free Tape and Reel |
| Si9987DY-T1—E3              | -40 to 85°C       |                         |
| Si9987CY                    | 0 to 70°C         | Bulk (tubes)            |
| Si9987DY                    | -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         |
| Maximum $V_{DD}$                          | 15 V                       |
| Peak Output Current                       | 1.5 A                      |
| Storage Temperature                       | -65 to 150°C               |
| Maximum Junction Temperature ( $T_J$ )    | 150°C                      |
| Power Dissipation <sup>b</sup>            | 1 W                        |
| $\theta_{JA}$                             | 100°C/W                    |

|   |              |
|---|--------------|
| Continuous $I_{OUT}$ Current ( $T_J = 135^\circ\text{C}$ ) <sup>c</sup> |              |
| $T_A = 25^\circ\text{C}$  | $\pm 1.02$ A |
| $T_A = 70^\circ\text{C}$  | $\pm 0.75$ A |
| $T_A = 85^\circ\text{C}$  | $\pm 0.65$ A |
| Operating Temperature Range   |              |
| Si9987CY  | 0 to 70°C    |
| Si9987DY  | -40 to 85°C  |

#### Notes

- Device mounted with all leads soldered or welded to PC board.
- Derate 10 mW/°C above 25°C.
- $T_J = T_A + (P_D \times \theta_{JA})$ ,  $P_D$  = Power Dissipation.

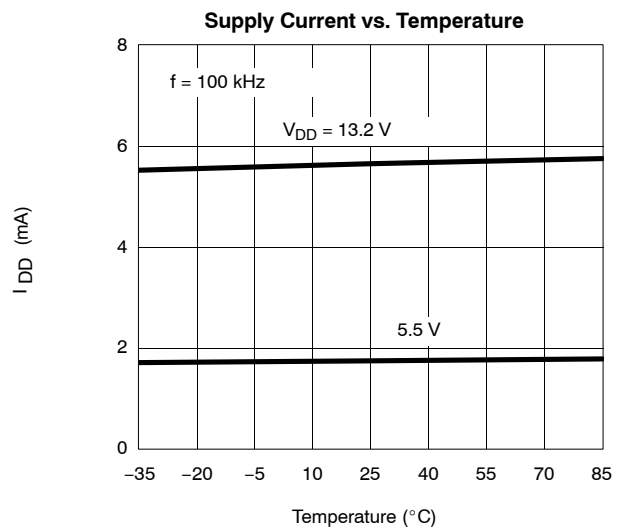
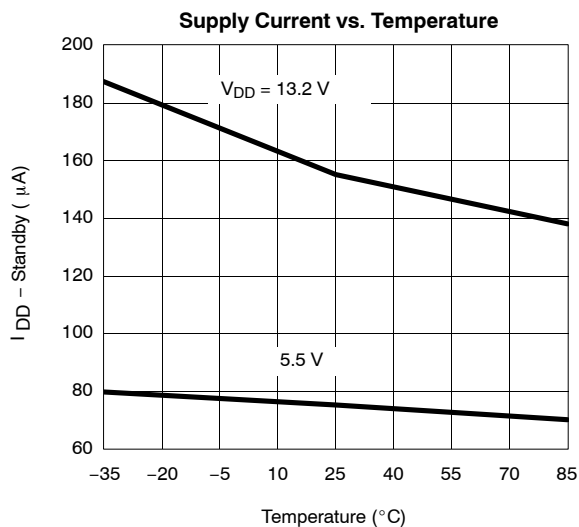
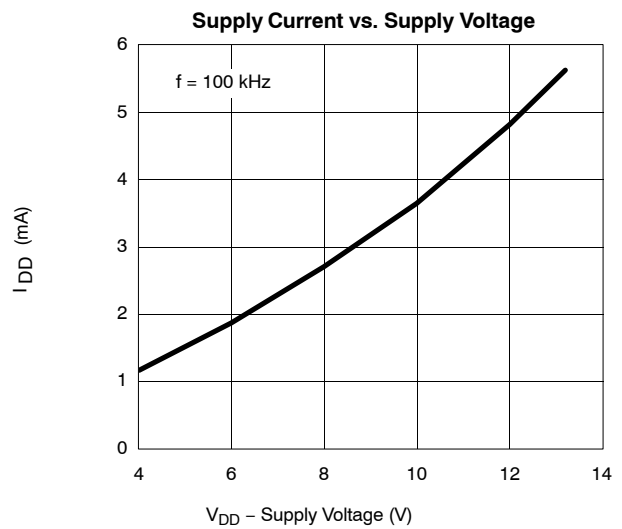
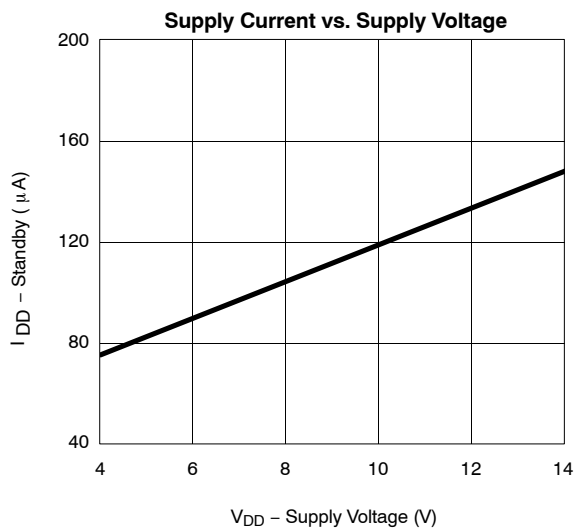
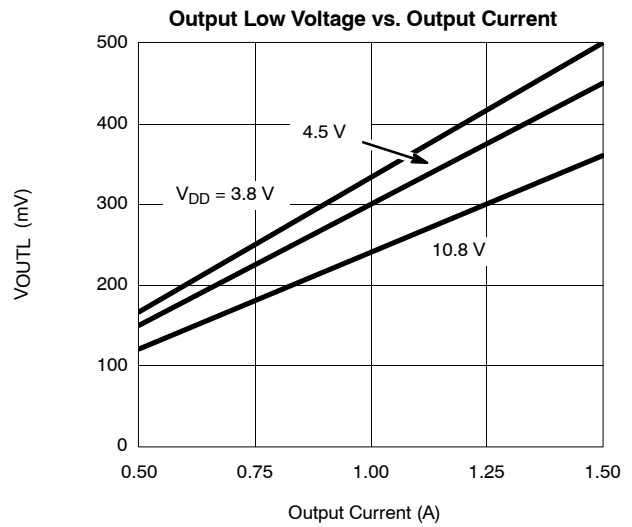
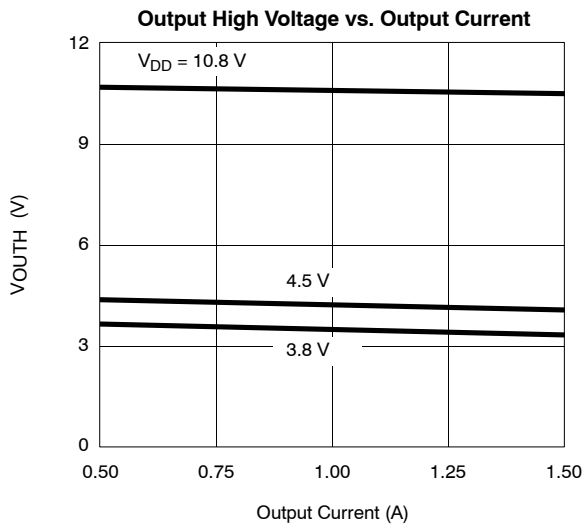
### RECOMMENDED OPERATING RANGE

|  |                 |
|--|-----------------|
| $V_{DD}$                               | 3.8 V to 13.2 V |
| Maximum Junction Temperature ( $T_J$ ) | 135°C           |

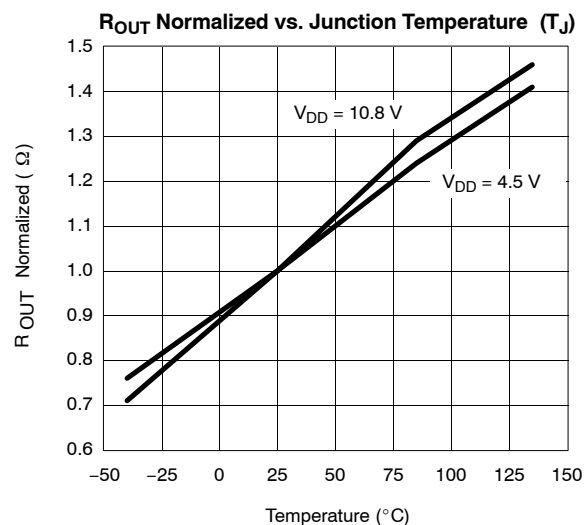
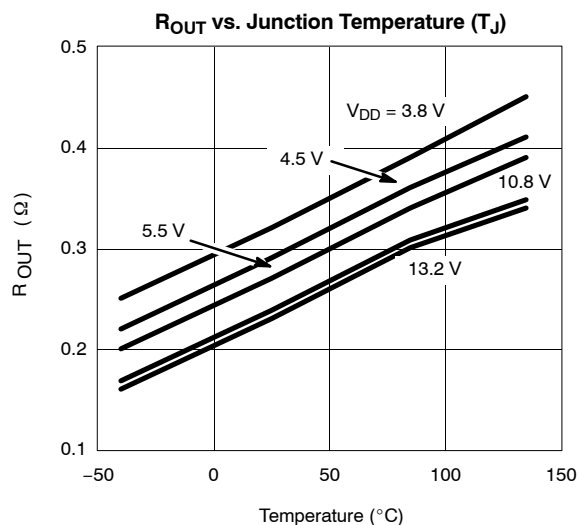
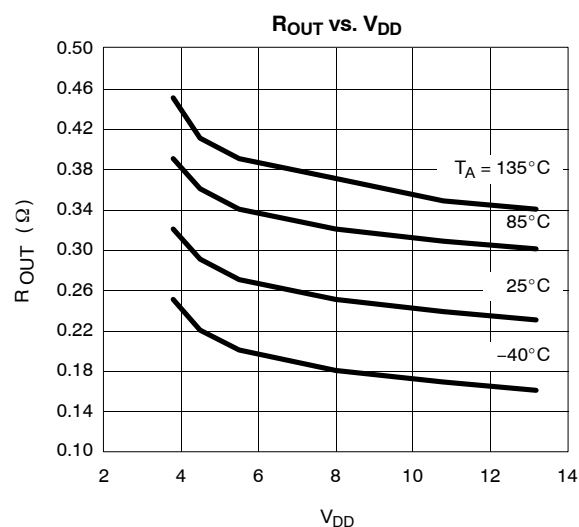
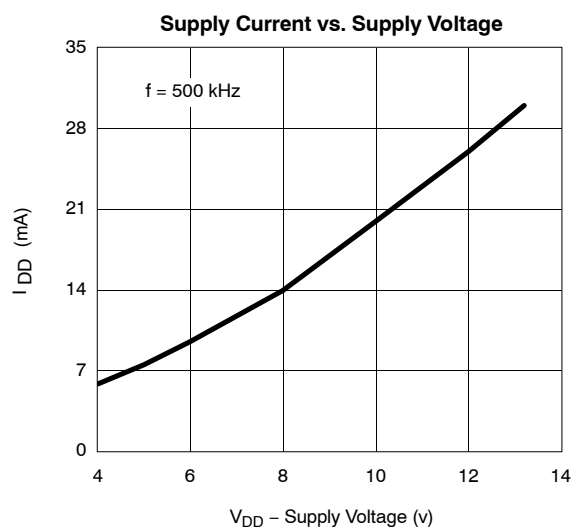
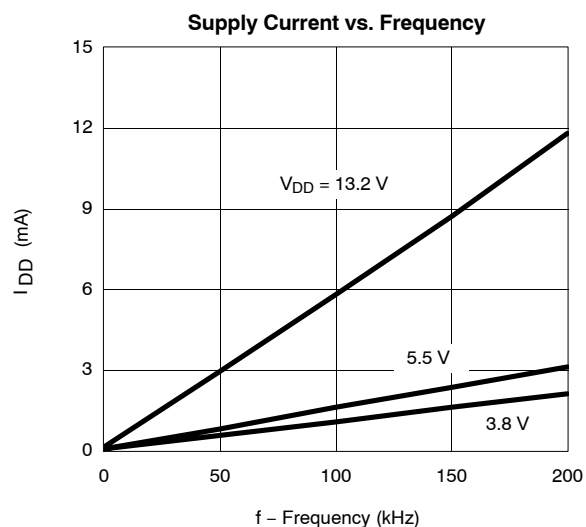
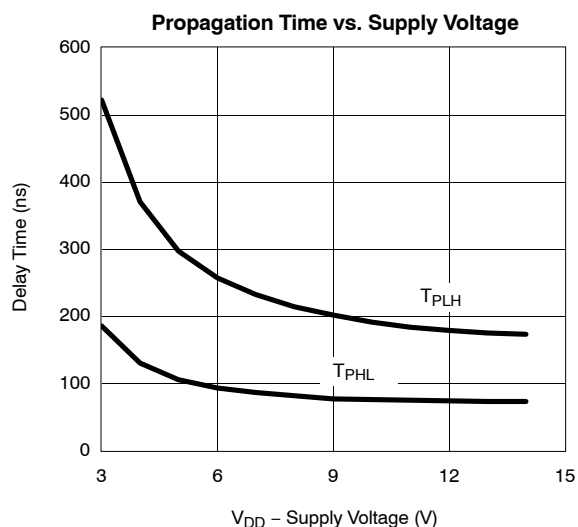
| SPECIFICATIONS                        |            |  |                     |                  |                  |               |
|---------------------------------------|------------|--|---------------------|------------------|------------------|---------------|
| Parameter                             | Symbol     | Test Conditions Unless Specified<br>$V_{DD} = 3.8$ to $13.2$ V<br>$S_A$ @ GND, $S_B$ @ GND | Limits              |                  |                  | Unit          |
|                                       |            |  | Min <sup>a</sup>    | Typ <sup>b</sup> | Max <sup>a</sup> |               |
| <b>Input</b>                          |            |  |                     |                  |                  |               |
| 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                | $\mu\text{A}$ |
| Input Current with Input Voltage Low  | $I_{INL}$  | $V_{IN} = 0$ V   | -1                  |                  |                  |               |
| <b>Output</b>                         |            |  |                     |                  |                  |               |
| Output Voltage High <sup>c</sup>      | $V_{OUTH}$ | $I_{OUT} = -1$ A   | $V_{DD} = 10.8$ V   | 10.40            | 10.56            | V             |
|                                       |            |  | $V_{DD} = 4.5$ V    | 4.00             | 4.20             |               |
|                                       |            | $I_{OUT} = -500$ mA  | $V_{DD} = 10.8$ V   | 10.60            | 10.68            |               |
| $V_{DD} = 4.5$ V                      | 4.25       |  | 4.35                |                  |                  |               |
|                                       |            | $I_{OUT} = -300$ mA, $V_{DD} = 3.8$ V  | 3.63                | 3.70             |                  |               |
| Output Voltage Low <sup>c</sup>       | $V_{OUTL}$ | $I_{OUT} = 1$ A  | $V_{DD} = 10.8$ V   |                  | 0.24             |               |
|                                       |            |  | $V_{DD} = 4.5$ V    |                  | 0.30             | 0.50          |
|                                       |            | $I_{OUT} = 500$ mA   | $V_{DD} = 10.8$ V   |                  | 0.12             | 0.20          |
|                                       |            |  | $V_{DD} = 4.5$ V    |                  | 0.15             | 0.25          |
|                                       |            | $I_{OUT} = 300$ mA, $V_{DD} = 3.8$ V   |                     | 0.10             | 0.17             |               |
| Output Leakage Current Low            | $I_{OLL}$  | $I_{NA} = I_{NB} \geq 2$ V, $V_{OUT} = V_{DD} = 13.2$ V                                    |                     | 0                | 10               | $\mu\text{A}$ |
| Output Leakage Current High           | $I_{OLH}$  | $V_{OUT} = 0$ , $V_{DD} = 13.2$ V  | -10                 | 0                |                  |               |
| Output V Clamp High                   | $V_{CLH}$  | $I_{NA} = I_{NB} \geq 2$ V   | $I_{OUT} = 100$ mA  | $V_{DD} + 0.7$   | $V_{DD} + 0.9$   | V             |
| Output V Clamp Low                    | $V_{CLL}$  |  | $I_{OUT} = -100$ mA | -0.9             | -0.7             |               |
| <b>Supply</b>                         |            |  |                     |                  |                  |               |
| $V_{DD}$ Supply Current               | $I_{DD}$   | $I_N = 100$ kHz, $V_{DD} = 5.5$ V  |                     | 1.8              | 2.5              | mA            |
|                                       |            | $I_{NA} = I_{NB} = 4.5$ V, $V_{DD} = 5.5$ V  |                     | 75               | 125              | $\mu\text{A}$ |
| <b>Dynamic</b>                        |            |  |                     |                  |                  |               |
| Propogation Delay Time                | $T_{PLH}$  | $V_{DD} = 5$ V   |                     | 300              |                  | nS            |
|                                       | $T_{PHL}$  |  |                     | 100              |                  |               |

#### Notes

- The algebraic convention whereby the most negative value is a minimum and the most positive a maximum, is used in this data sheet.
- Typical values are for DESIGN AID ONLY, not guaranteed nor subject to production testing.
- Maximum value measured at  $T_J = 135^\circ\text{C}$ . Typical value measured at  $T_J = T_A = 25^\circ\text{C}$  (pulse width  $\leq 300$   $\mu\text{sec}$ , duty cycle  $\leq 2\%$ ).

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


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