

# Buffered H-Bridge Driver with Integrate MOSFET

## DESCRIPTION

The Si9986 is an integrated, buffered H-bridge with TTL compatible inputs and the capability of delivering a continuous 1 A at  $V_{DD} = 12\text{ V}$  (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 °C to 70 °C (C suffix) and the industrial temperature range of - 40 °C to 85 °C (D suffix).

## FEATURES

- 1 A H-bridge
- 200 kHz switching rate
- Shoot-through limited
- TTL compatible inputs
- 3.8 V to 13.2 V operating range
- Surface mount packaging

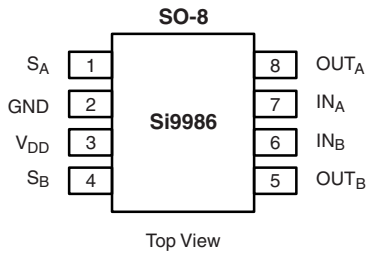


RoHS\*  
COMPLIANT

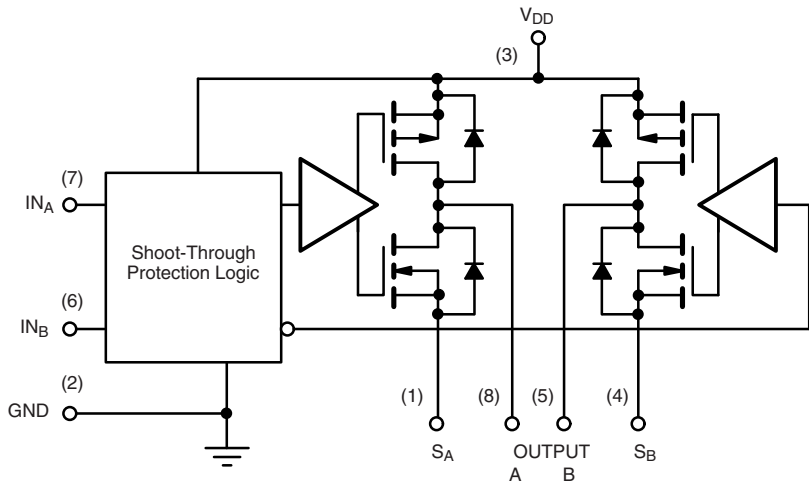
## APPLICATIONS

- 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



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



PIN DESCRIPTION		
Pin Number	Name	Function
1	S <sub>A</sub>	Source of the low-side MOSFET on bridge arm A
2	GND	Ground
3	V <sub>DD</sub>	IC power supply
4	S <sub>B</sub>	Source of the low-side MOSFET on bridge arm B
5	OUT <sub>B</sub>	Center tap of bridge arm B. Connects to one end of the load
6	IN <sub>B</sub>	Input signal to control bridge arm B
7	IN <sub>A</sub>	Input signal to control bridge arm A
8	OUT <sub>A</sub>	Center tap of bridge arm A. Connects to the other end of the load

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

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

ABSOLUTE MAXIMUM RATINGS <sup>a</sup>			
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 Ground	- 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 <sup>b</sup>	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.

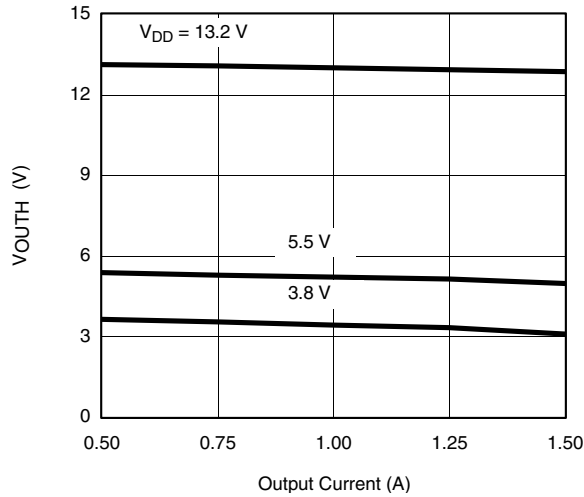
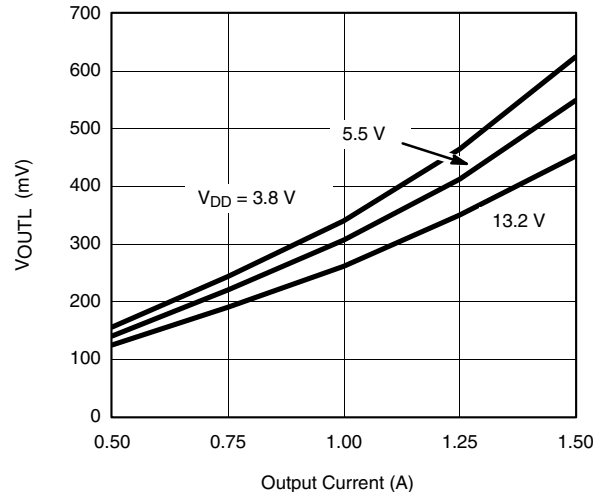
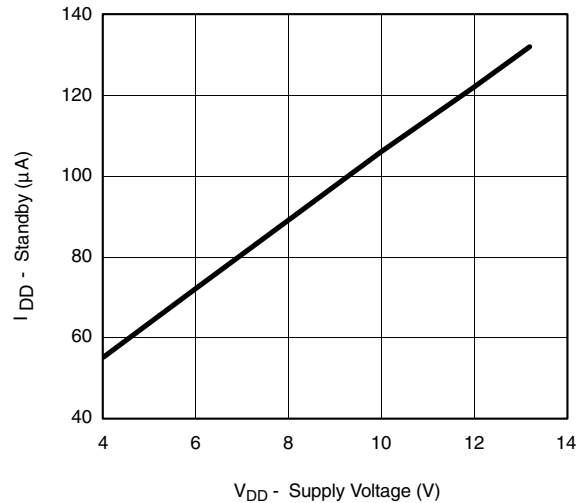
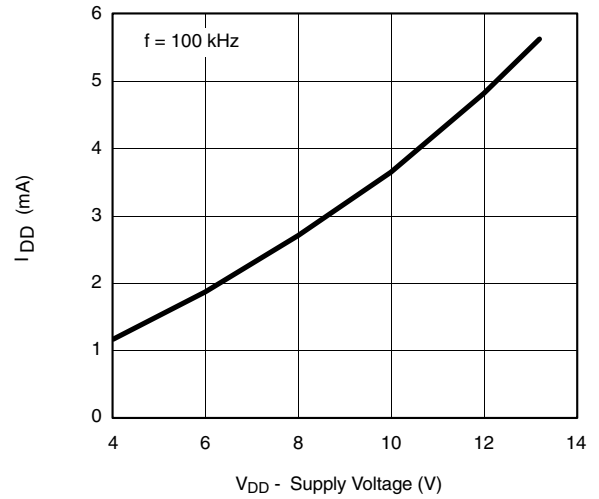
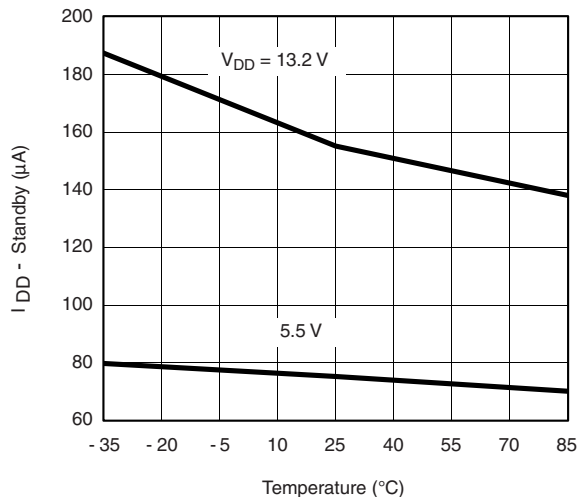
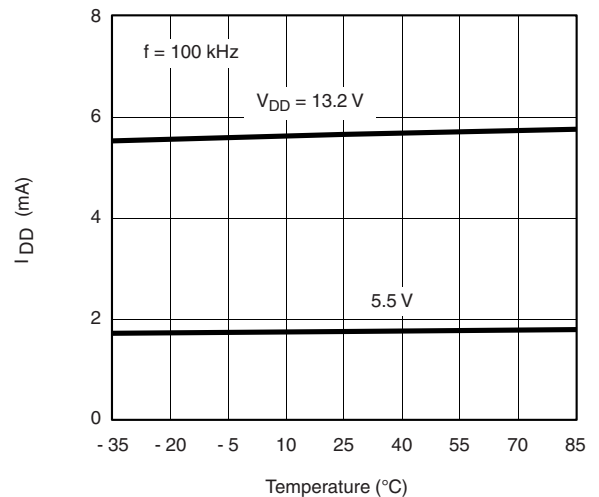
RECOMMENDED OPERATING RANGE			
Parameter	Limit		Unit
$V_{DD}$	3.8 to 13.2		V
Maximum Junction Temperature ( $T_J$ )	125		°C

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 °C to 70 °C D Suffix, - 40 °C to 85 °C			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	µA	
Input Current with Input Voltage Low	$I_{INL}$	$V_{IN} = 0$ V	- 1				
<b>Output</b>							
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		
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	$I_{OLH}$	$I_{NA} = I_{NB} \geq 2$ 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	$V_{CLH}$	$I_{NA} = I_{NB} \geq 2$ V	$I_{OUT} = 100$ mA		$V_{DD} + 0.7$	V	
Output V Clamp Low	$V_{CLL}$		$I_{OUT} = - 100$ mA		- 0.7		
<b>Supply</b>							
$V_{DD}$ Supply Current	$I_{DD}$	$I_N = 100$ kHz, $V_{DD} = 5$ V		2		mA	
		$I_{NA} = I_{NB} = 4.5$ V, $V_{DD} = 5.5$ V			300	µA	
<b>Dynamic</b>							
Propagation Delay Time	$T_{PLH}$	$V_{DD} = 5$ V		300		nS	
	$T_{PHL}$			100			

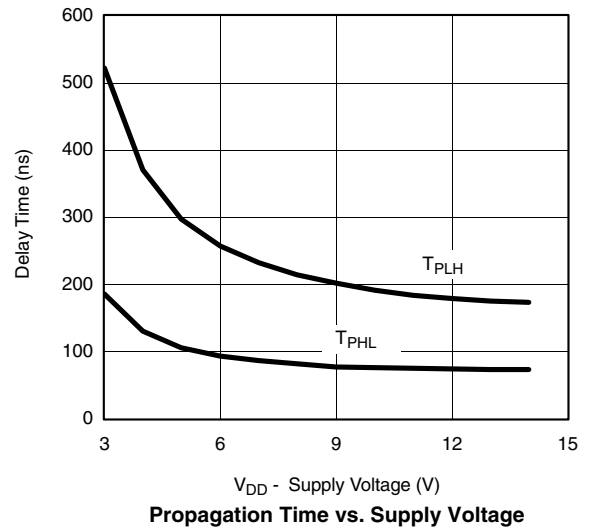
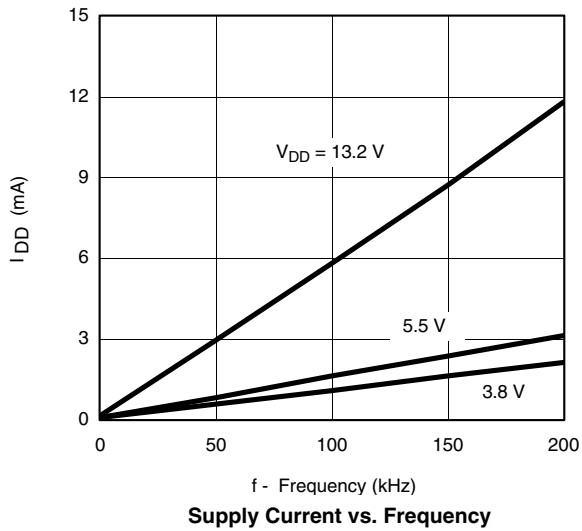
## Notes:

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.

**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)

**Output High Voltage vs. Output Current**

**Output Low Voltage vs. Output Current**

**Supply Current vs. Supply Voltage**

**Supply Current vs. Supply Voltage**

**Supply Current vs. Temperature**

**Supply Current vs. Temperature**

**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



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## SOIC (NARROW): 8-LEAD

JEDEC Part Number: MS-012



DIM	MILLIMETERS		INCHES	
	Min	Max	Min	Max
A	1.35	1.75	0.053	0.069
A <sub>1</sub>	0.10	0.20	0.004	0.008
B	0.35	0.51	0.014	0.020
C	0.19	0.25	0.0075	0.010
D	4.80	5.00	0.189	0.196
E	3.80	4.00	0.150	0.157
e	1.27 BSC		0.050 BSC	
H	5.80	6.20	0.228	0.244
h	0.25	0.50	0.010	0.020
L	0.50	0.93	0.020	0.037
q	0°	8°	0°	8°
S	0.44	0.64	0.018	0.026
ECN: C-06527-Rev. I, 11-Sep-06				
DWG: 5498				



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