Buffered H-Bridge Driver with Integrate MOSFET

DESCRIPTION

The Si9988 is an integrated, buffered H-bridge with TTL compatible inputs and the capability of delivering a continuous 0.65 A at V_{DD} = 5 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. Both outputs may be forced low (for motor braking) by pulling $\overline{EN}$ to logic high.

The Si9988 is available in both standard and lead (Pb)-free, 8-pin TSSOP packages, specified to operate over a voltage range of 3.8 V to 13.2 V, and the industrial temperature range of - 40 °C to 85 °C (D suffix).

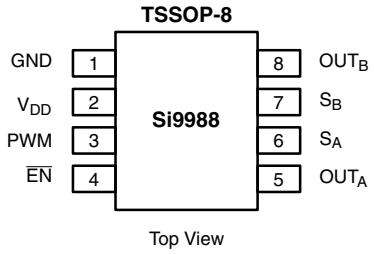
FEATURES

- 0.65 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
- Total $R_{DS(on)}$ for N- and P-channel:
  1.8 at V_{DD} = 4.5 V and T_A = 85 °C0.65 A H-bridge

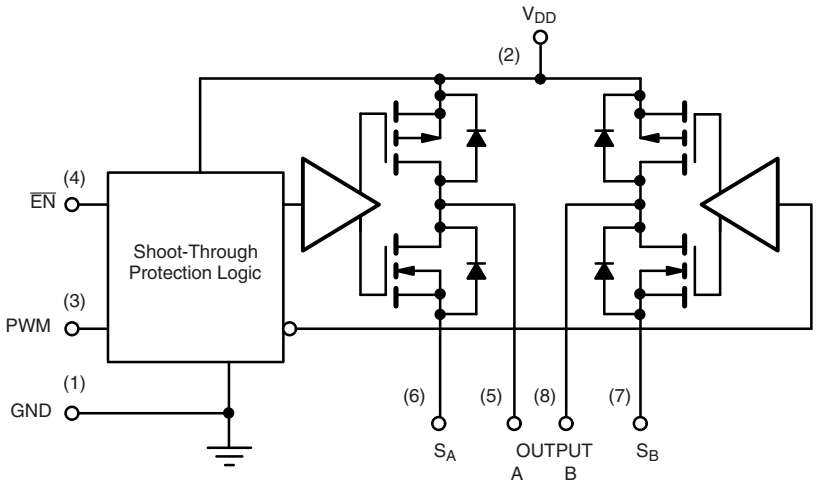
APPLICATIONS

- 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			
$\overline{EN}$	PWM	OUT_A	OUT_B
0	0	0	1
0	1	1	0
1	0	0	0
1	1	0	0



ORDERING INFORMATION			
Part Number	Marking	Temperature Range	Package
Si9988DQ-T1	988	- 40 °C to 85 °C	Tape and reel
Si9988DQ-T1-E3			

ABSOLUTE MAXIMUM RATINGS[a]

Parameter		Limit	Unit
V_{DD}		15	V
Voltage on any Pin with Respect to Ground		- 0.3 to V_{DD} + 0.3	
Voltage on Pins 5, 8 with Respect to Ground		- 1 to V_{DD} + 1	
Voltage on Pins 6, 7		- 0.3 to GND + 1	
Peak Output Current		1	A
Storage Temperature		- 65 to 150	°C
Junction Temperature (T_J)		150	
Continuos I_{out} Current (T_J = 135 °C, Y_{DD} = 5 V)	T_A = 25 °C	0.67	A
	T_A = 85 °C	0.47	
Power Dissipation[b]		0.83	W
θ_{JA}		120	°C/W
Operating Temperature Range		- 40 to 85	°C

Notes:
a. Device mounted with all leads soldered or welded to PC board.
b. Derate 8.3 mW/°C above 25 °C.
c. $T_J = T_A + (P_D)(\theta_{JA})$, P_D = power dissipation.

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)	135	°C

SPECIFICATIONS

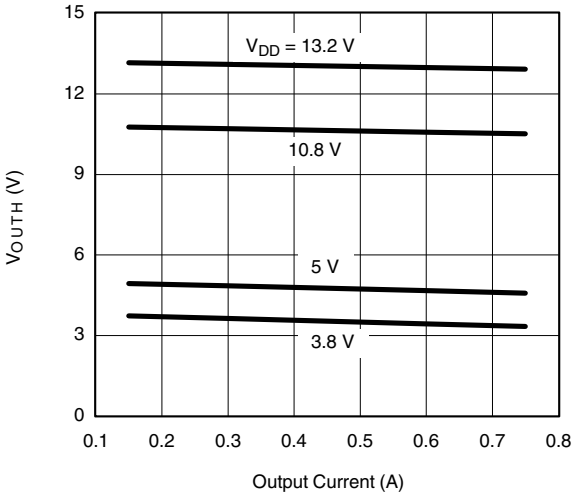
Parameter	Symbol	Test Conditions Unless Otherwise Specified V_{DD} = 3.8 to 13.2 V S_A at GND, S_B at GND		Limits D Suffix, - 40 °C to 85 °C Min[a]	Typ[b]	Max[a]	Unit
Input ($\overline{EN}$, PWM)							
Input Voltage High	V_{INH}			2			V
Input Voltage Low	V_{INL}					1	
Input Current with Input Voltage High	I_{INH}	V_{IN} = 13.2 V				1	µA
Input Current with Input Voltage Low	I_{INL}	V_{IN} = 0 V		- 1			
Output							
Output Voltage High[c]	V_{OUTH}	I_{OUT} = - 300 mA	V_{DD} = 10.8 V	10.55	10.70		V
			V_{DD} = 4.5 V	4.20	4.35		
			V_{DD} = 3.8 V	3.40	3.62		
Output Voltage Low[c]	V_{OUTL}	I_{OUT} = 300 mA	V_{DD} = 10.8 V		0.09	0.20	
			V_{DD} = 4.5 V		0.12	0.25	
			V_{DD} = 3.8 V		0.14	0.30	
Output V Clamp High	V_{CLH}	$\overline{EN}$ = PWM ≥ 2 V	I_{OUT} = 100 mA		V_{DD} + 0.7	V_{DD} + 1.0	V
Output V Clamp Low	V_{CLL}		I_{OUT} = - 100 mA	- 1.0	- 0.7		
Supply							
V_{DD} Supply Current	I_{DD}	$\overline{EN}$ = 0 V, PWM = 100 kHz, V_{DD} = 5 V			1.0	1.5	mA
		$\overline{EN}$ = 4.5 V, PWM = 100 kHz, V_{DD} = 5.5 V			60	140	µA
		$\overline{EN}$ = PWM = 4.5 V, V_{DD} = 5.5 V			55	110	

SPECIFICATIONS

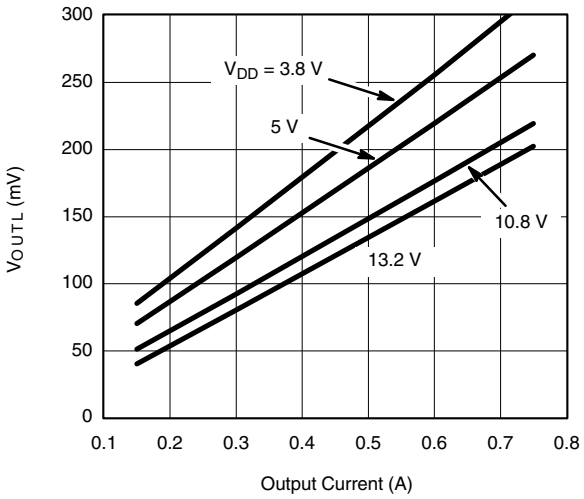
Parameter	Symbol	Test Conditions Unless Otherwise Specified V_{DD} = 3.8 V to 13.2 V, S_A at GND, S_B at GND	Limits D Suffix, - 40 °C to 85 °C			Unit
			Min[a]	Typ[b]	Max[a]	
Dynamic						
Propagation Delay - OUT_A[d]	T_{PLH}	V_{DD} = 5 V, $\overline{EN}$ = 0 V		300		nS
	T_{PHL}			115		
Propagation Delay - OUT_B[d]	T_{PLH}			75		
	T_{PHL}			330		
Break-Before-Make[d]	BBM_{PLH}			225		
	BBM_{PHL}			215		

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, measured T_A = 25 °C.
c. Min and Max value measured at T_J = 135 °C.
d. PLH = PWM low to high, PHL = PWM high to low.

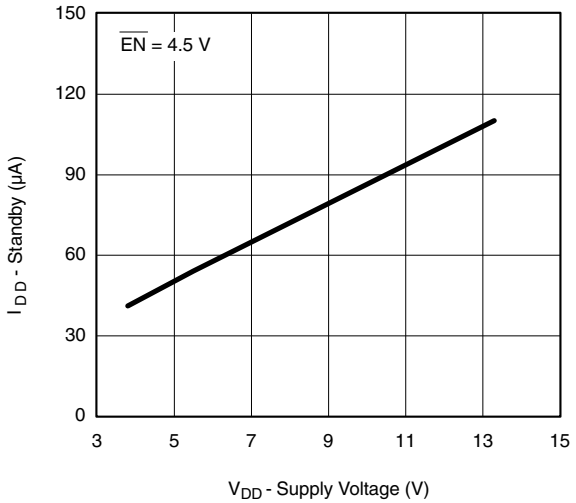
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



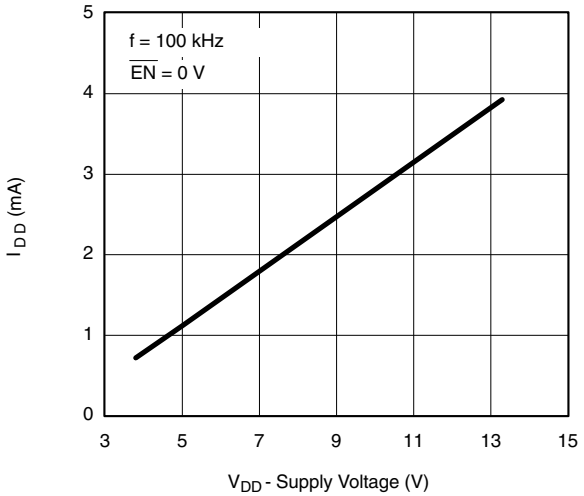
Output High Voltage vs. Output Current



Output Low Voltage vs. Output Current

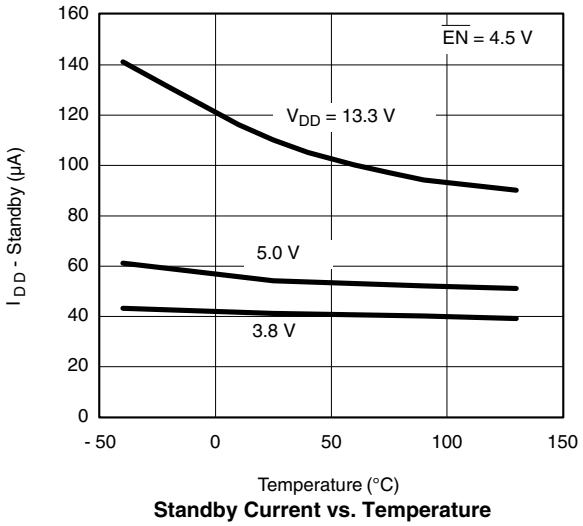


Standby Current vs. Supply Voltage

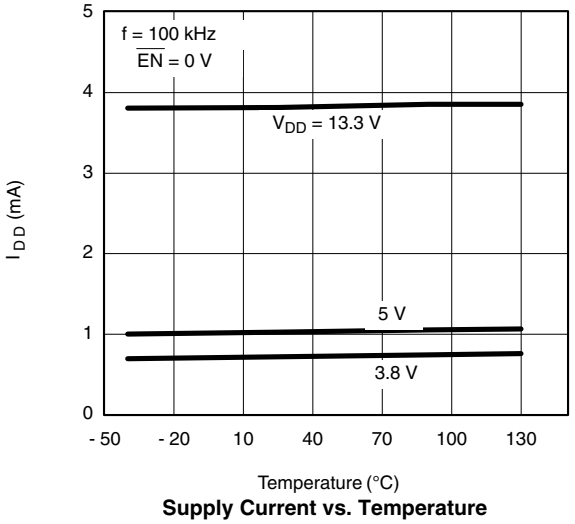


Supply Current vs. Supply Voltage

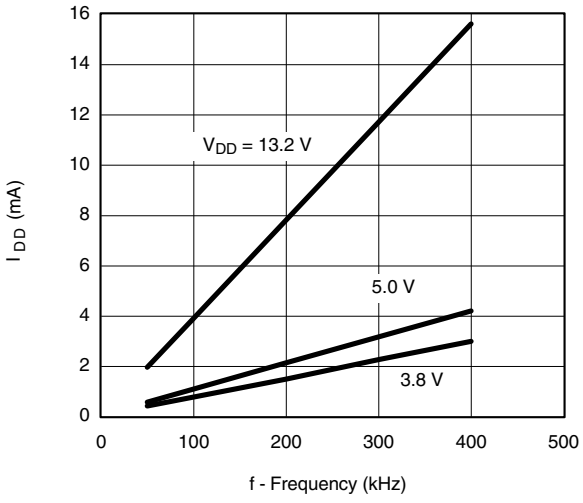
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



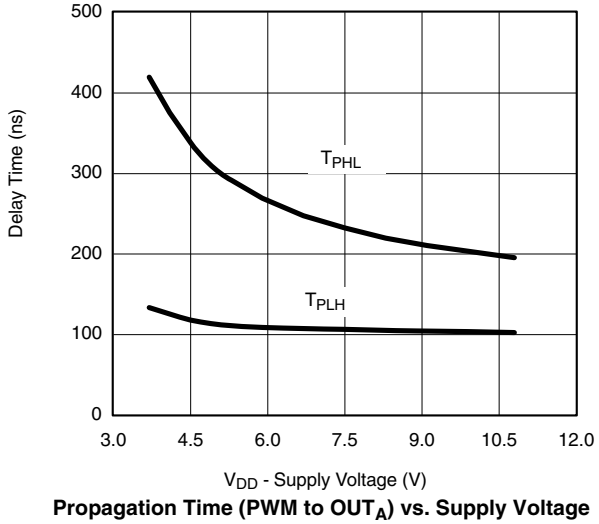
Standby Current vs. Temperature



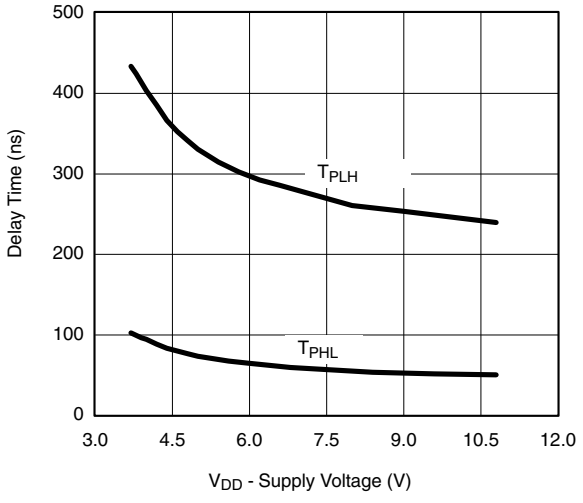
Supply Current vs. Temperature



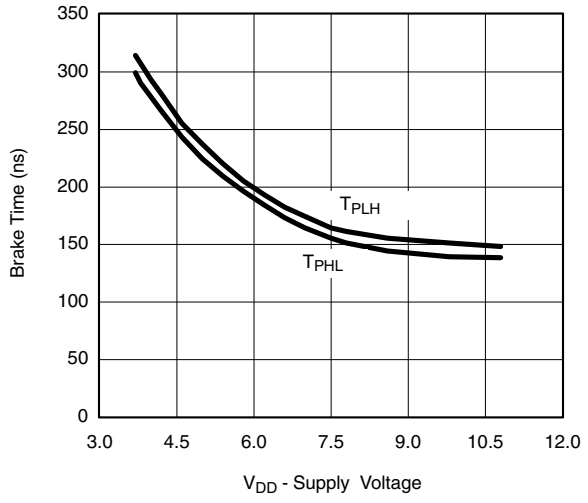
Supply Current vs. Frequency



Propagation Time (PWM to OUT_A) vs. Supply Voltage



Propagation Time (PWM to OUT_B) vs. Supply Voltage



Brake_Before_Make Time vs. Supply Voltage

TIMING WAVEFORMS

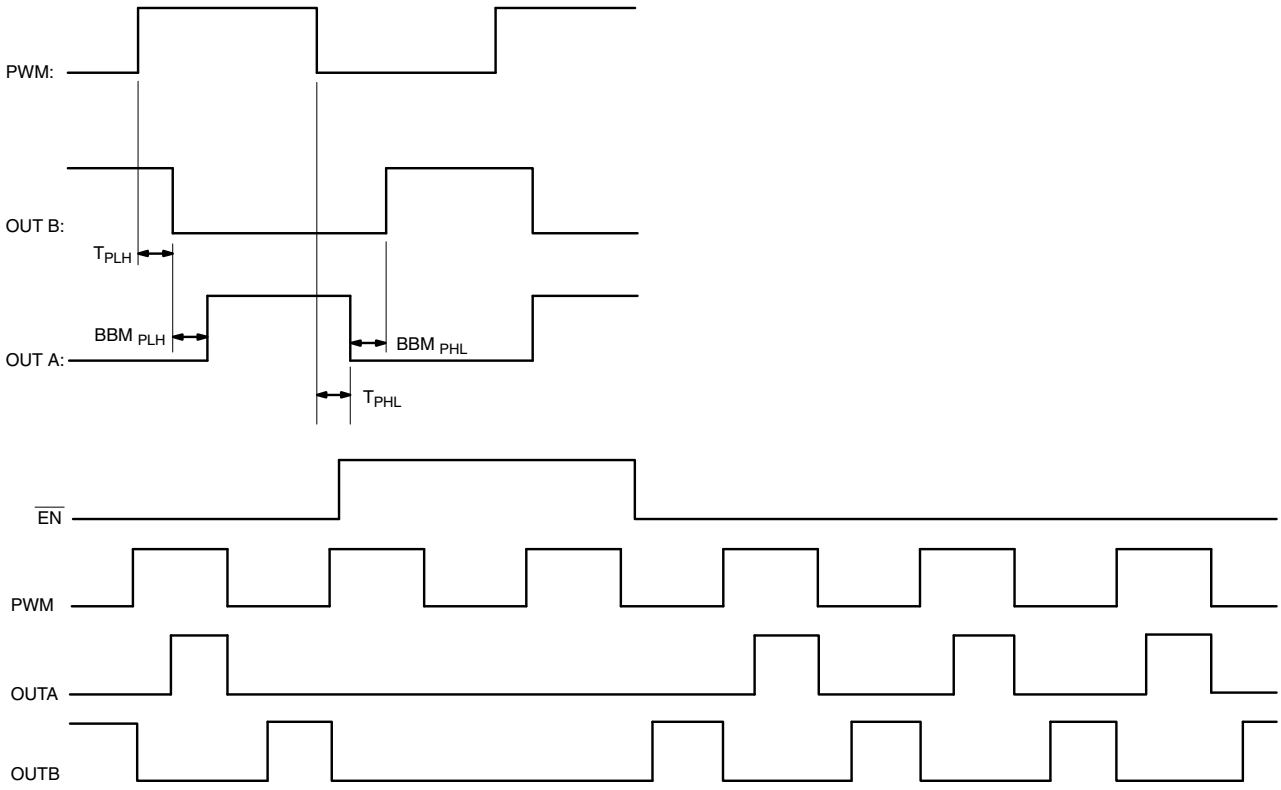
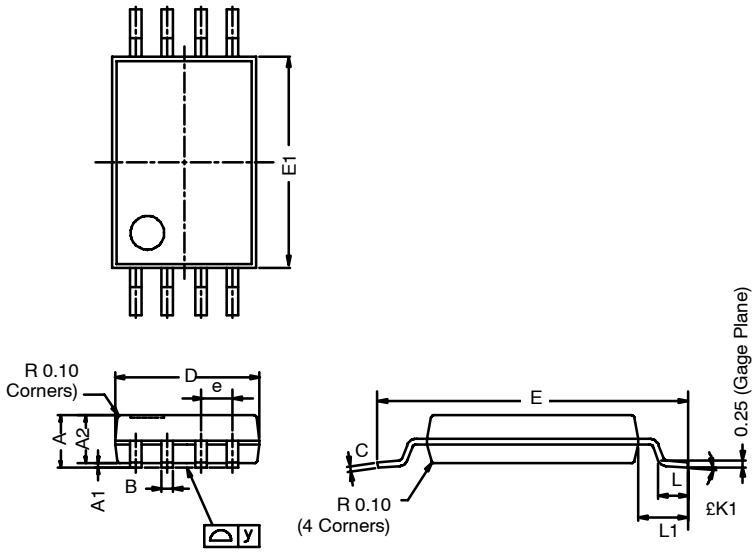


Figure 1.

Vishay Siliconix maintains worldwide manufacturing capability. Products may be manufactured at one of several qualified locations. Reliability data for Silicon Technology and Package Reliability represent a composite of all qualified locations. For related documents such as package/tape drawings, part marking, and reliability data, see http://www.vishay.com/ppg?71326.

TSSOP: 8-LEAD (POWER IC ONLY)

JEDEC Part Number: MO-153



Dim	MILLIMETERS		
	Min	Nom	Max
A	–	–	1.20
A_1	0.05	0.10	0.15
A_2	0.80	1.00	1.05
B	0.19	0.28	0.30
C	–	0.127	–
D	2.90	3.00	3.10
E	6.20	6.40	6.60
E_1	4.30	4.40	4.50
e	–	0.65	–
L	0.45	0.60	0.75
L_1	0.90	1.00	1.10
Y	–	–	0.10
£K1	0°	3°	6°

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DWG: 5908

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