



ELECTRONICS, INC.  
 44 FARRAND STREET  
 BLOOMFIELD, NJ 07003  
 (973) 748-5089  
<http://www.nteinc.com>

## NTE7196 Integrated Circuit H-Bridge with Motor Control

**Description:**

The NTE7196 is a 3A H-Bridge in an 11-Lead Staggered SIP type package designed for motion control applications. The device is built using a multi-technology process which combines bipolar and CMOS control circuitry with DMOS power devices on the same monolithic structure. The H-Bridge configuration is ideal for driving DC and stepper motors. The NTE7196 accommodates peak output currents up to 6A. Current sensing can be achieved via a small sense resistor connected in series with the power ground lead. For current sensing without disturbing the path of current to the load, the NTE7196 is recommended.

**Features:**

- Delivers up to 3A Continuous Output
- Operates at Supply Voltages up to 55V
- Low  $R_{DS(ON)}$  Typically  $0.33\Omega$  per Switch
- TTL and CMOS Compatible Inputs
- No “Shoot-Through” Current
- Thermal Warning Flag Output at  $+145^{\circ}C$
- Thermal Shutdown (Outputs off) at  $+170^{\circ}C$
- Internal Clamp Diodes
- Shorted Load Protection
- Internal Charge Pump w/External Bootstrap Capability

**Applications:**

- DC and Stepper Motor Drives
- Position and Velocity Servomechanisms
- Factory Automation Robots
- Numerically Controlled Machinery
- Computer Printers and Plotters

**Absolute Maximum Ratings:** (Note 1)

Total Supply Voltage ( $V_S$ ; Pin6) .....	60V
Voltage at Pins 3, 4, 5, and 9 .....	12V
Voltage at Bootstrap Pins (Pin1 and Pin11) .....	$V_{OUT} + 16V$
Peak Output Current (200ms) .....	6A
Continuous Output Current .....	3A
Power Dissipation (Note 2) .....	25W
Sense Voltage (Pin7 to Pin8) .....	+0.5V to -1.0V
Power Dissipation ( $T_A = +25^{\circ}C$ , Free Air) .....	3W
Junction Temperature, $T_{J(max)}$ .....	$150^{\circ}C$
ESD Susceptibility (Note 3) .....	1500V
Storage Temperature, $T_{STG}$ .....	$-40^{\circ}$ to $+150^{\circ}C$
Lead Temperature (Soldering, 10 sec.) .....	$+300^{\circ}C$

- Note 1. Absolute maximum ratings indicate limits beyond which damage to the device may occur. DC and AC electrical specifications do not apply when operating the device beyond its rated operating conditions
- Note 2. The maximum power dissipation must be derated at elevated temperatures and is a function of  $T_{J(max)}$ ,  $R_{thJA}$ , and  $T_A$ . The maximum allowable power dissipation at any temperature is  $P_{D(max)} = (T_{J(max)} - T_A)/R_{thJA}$ , or the number given in the Absolute Maximum Ratings, whichever is lower. The typical thermal resistance from junction to case ( $R_{thJC}$ ) is 1.0°C/W and from junction to ambient ( $R_{thJA}$ ) is 30°C/W. For guaranteed operation  $T_{J(max)} = +125^\circ\text{C}$ .
- Note 3. Human-Body model, 100 pF discharged through a 1.5 kΩ resistor. Except Bootstrap pins (pins 1 and 11) which are protected to 1000V of ESD

**Recommended Operating Conditions:** (Note 1)

Junction Temperature,  $T_J$  ..... -40° to +125°C  
 $V_S$  Supply Voltage ..... +12V to +55V

- Note 1 Absolute maximum ratings indicate limits beyond which damage to the device may occur. DC and AC electrical specifications do not apply when operating the device beyond its rated operating conditions

**Electrical Characteristics:** ( $V_S = 42\text{V}$ ,  $T_A = T_J = +25^\circ\text{C}$ , Note 5, unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit	
Switch ON Resistance	$R_{DS(ON)}$	$I_O = 3\text{A}$ , Note 5	-	0.33	0.4	Ω	
Switch ON Resistance	$R_{DS(ON)}$	$-40^\circ \leq T_j \leq +125^\circ\text{C}$	-	0.33	0.6	Ω	
Switch ON Resistance	$R_{DS(ON)}$	$I_O = 6\text{A}$ , Note 5	-	0.33	0.4	Ω	
Switch ON Resistance	$R_{DS(ON)}$	$-40^\circ \leq T_j \leq +125^\circ\text{C}$	-	0.33	0.6	Ω	
Clamp Diode Forward Drop	$V_{CLAMP}$	Clamp Current = 3A, Note 5	-	1.2	.5	V	
Logic Low Input Voltage	$V_{IL}$	Pins 3, 4, 5	-	-	-0.10	V	
Logic Low Input Voltage	$V_{IL}$	$-40^\circ \leq T_j \leq +125^\circ\text{C}$	-	-	0.8	V	
Logic Low input Current	$I_{IL}$	$V_{IN} = -0.1\text{V}$ , Pincs = 3, 4, 5, $-40^\circ \leq T_j \leq +125^\circ\text{C}$	-	-	-10	μA	
Logic High Input Voltage	$V_{IH}$	Pins 3, 4, 5, $-40^\circ \leq T_j \leq +125^\circ\text{C}$	2	-	12	V	
Logic High Input Current	$I_{IL}$	$V_{IN} = 12\text{V}$ , Pins 3, 4, 5	-	-	10	μA	
Undervoltage Lockout		Outputs Turn OFF	9	-	11	V	
Warning Flag Temperature	$T_{JW}$	Pin 9 $\leq 0.8\text{V}$ , $I_L = 2\text{mA}$	-	145	-	°C	
Flag Output Saturation Voltage	$V_{F(ON)}$	$T_J = T_{JW}$ , $I_L = 2\text{mA}$	-	0.15	-	V	
Flag Output Leakage	$I_{F(OFF)}$	$V_F = 12\text{V}$	-	0.2	10	μA	
Shutdown Temperature	$T_{JSD}$	Outputs Turn Off	-	170	-	°C	
Quiescent Supply Current	$I_S$	All Logic Inputs Low	-	13	25	mA	
Output Turn-On Delay Time	$t_{D(ON)}$	Sourcing Outputs, $I_{OUT} = 3\text{A}$	-	300	-	ns	
		Sinking Outputs, $I_{OUT} = 3\text{A}$	-	300	-	ns	
Output Turn-On Switching Time	$t_{ON}$	Bootstrap Capacitor = 10 nF	Sourcing Outputs, $I_{OUT} = 3\text{A}$	-	100	-	ns
			Sinking Outputs, $I_{OUT} = 3\text{A}$	-	80	-	ns
Output Turn-Off Delay Times	$T_{D(OFF)}$	Sourcing Outputs, $I_{OUT} = 3\text{A}$	-	200	-	ns	
		Sinking Outputs, $I_{OUT} = 3\text{A}$	-	200	-	ns	

- Note 4. All limits are 100% production tested at +25°C. Temperature extreme limits are guaranteed via correlation using accepted SQC (Statistical Quality control) methods. All limits are used to calculate AOQL, (Average Outgoing Quality Level).

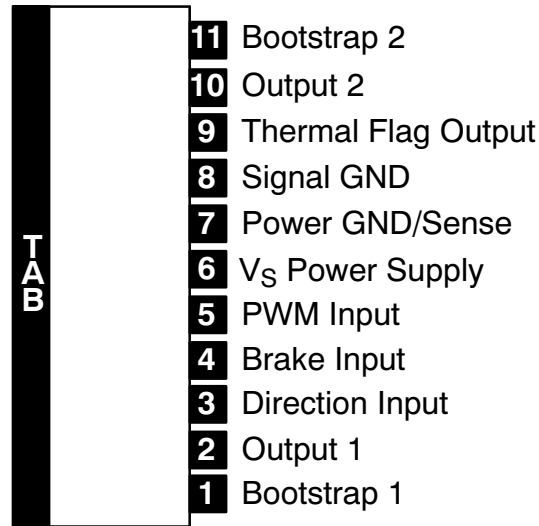
- Note 5. Output currents are pulsed ( $t_W < 2\text{ms}$ , Duty Cycle < 5%).

**Electrical Characteristics (Cont'd):** ( $V_S = 42V$ ,  $T_A = T_J = +25^\circ C$ , Note 4, unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit	
Output Turn-Off Switching Times	$t_{OFF}$	Bootstrap Capacitor = 10 nF	Sourcing Outputs, $I_{OUT} = 3A$	-	75	-	ns
			Sinking Outputs, $I_{OUT} = 3A$	-	70	-	ns
Minimum Input Pulse Width	$t_{PW}$	Pins 3, 4, and 5	-	1	-	$\mu S$	
Charge Pump Rise Time	$t_{CPR}$	No Bootstrap Capacitor	-	20	-	$\mu S$	

Note 4 All limits are 100% production tested at  $+25^\circ C$ . Temperature extreme limits are guaranteed via correlation using accepted SQC (Statistical Quality control) methods. All limits are used to calculate AOQL, (Average Outgoing Quality Level).

**Pin Connection Diagram**  
(Front View)



**Note:** Tab connected to Pin7.

