

LMD18201

3A, 55V H-Bridge

General Description

The LMD18201 is a 3A H-Bridge 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 LMD18201 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 LMD18200 is recommended.

Features

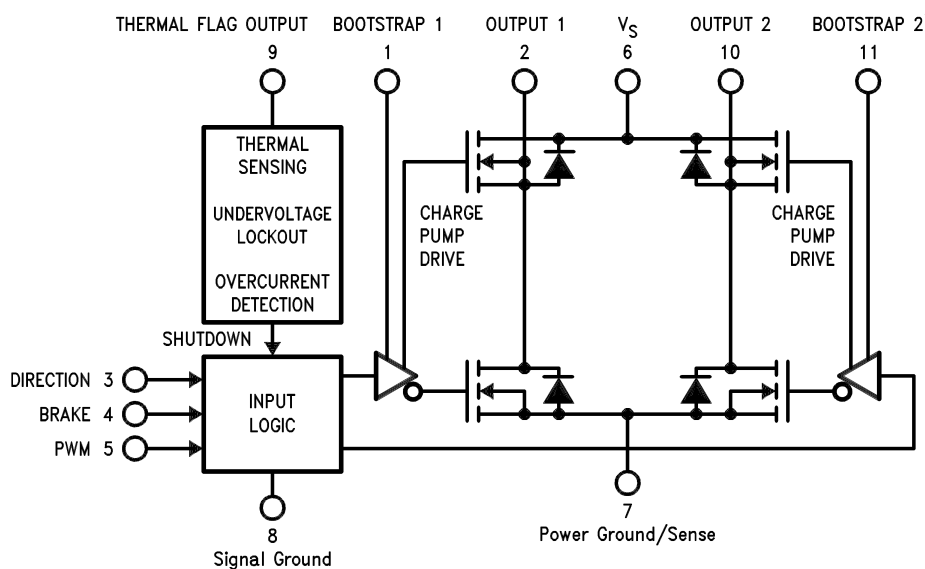
- Delivers up to 3A continuous output
- Operates at supply voltages up to 55V
- Low $R_{DS(ON)}$ typically 0.33 Ω per switch

- TTL and CMOS compatible inputs
- No "shoot-through" current
- Thermal warning flag output at 145°C
- Thermal shutdown (outputs off) at 170°C
- Internal clamp diodes
- Shorted load protection
- Internal charge pump with external bootstrap capability

Applications

- DC and stepper motor drives
- Position and velocity servomechanisms
- Factory automation robots
- Numerically controlled machinery
- Computer printers and plotters

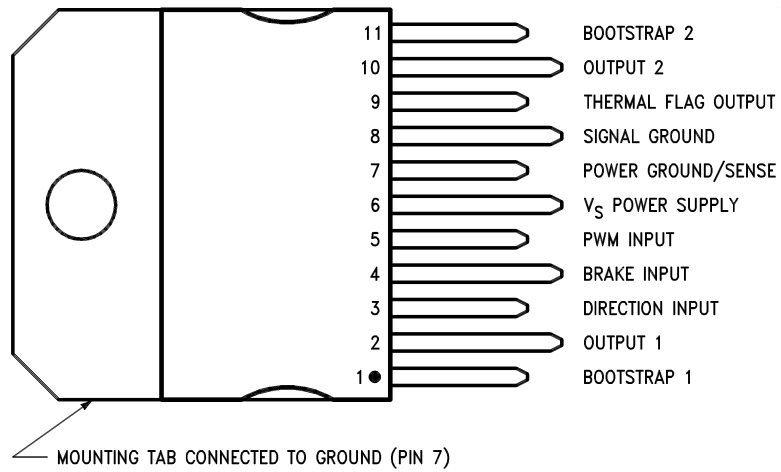
Functional Diagram



01079301

FIGURE 1. Functional Block Diagram of LMD18201

Connection Diagram and Ordering Information



01079302

Top View
Order Number LMD18201T
See NS Package Number TA11B

Absolute Maximum Ratings (Note 1)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Total Supply Voltage (V_S , Pin 6)	60V
Voltage at Pins 3, 4, 5 and 9	12V
Voltage at Bootstrap Pins (Pins 1 and 11)	$V_{OUT} + 16V$
Peak Output Current (200 ms)	6A
Continuous Output Current (Note 2)	3A
Power Dissipation (Note 3)	25W
Sense Voltage (Pin 7 to Pin 8)	+0.5V to -1.0V

Power Dissipation ($T_A = 25^\circ\text{C}$, Free Air)	3W
Junction Temperature, $T_{J(max)}$	150°C
ESD Susceptibility (Note 4)	1500V
Storage Temperature, T_{STG}	-40°C to +150°C
Lead Temperature (Soldering, 10 sec.)	300°C

Operating Ratings(Note 1)

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

Electrical Characteristics(Note 5)

The following specifications apply for $V_S = 42V$, unless otherwise specified. **Boldface** limits apply over the entire operating temperature range, $-40^\circ\text{C} \leq T_J \leq +125^\circ\text{C}$, all other limits are for $T_A = T_J = 25^\circ\text{C}$.

Symbol	Parameter	Conditions	Typ	Limit	Units
$R_{DS(ON)}$	Switch ON Resistance	Output Current = 3A (Note 6)	0.33	0.4/ 0.6	Ω (max)
$R_{DS(ON)}$	Switch ON Resistance	Output Current = 6A (Note 6)	0.33	0.4/ 0.6	Ω (max)
V_{CLAMP}	Clamp Diode Forward Drop	Clamp Current = 3A (Note 6)	1.2	1.5	V (max)
V_{IL}	Logic Low Input Voltage	Pins 3, 4, 5		-0.1 0.8	V (min) V (max)
I_{IL}	Logic Low Input Current	$V_{IN} = -0.1V$, Pins = 3, 4, 5		-10	μA (max)
V_{IH}	Logic High Input Voltage	Pins 3, 4, 5		2 12	V (min) V (max)
I_{IH}	Logic High Input Current	$V_{IN} = 12V$, Pins = 3, 4, 5		10	μA (max)
	Undervoltage Lockout	Outputs Turn OFF		9 11	V (min) V (max)
T_{JW}	Warning Flag Temperature	Pin 9 $\leq 0.8V$, $I_L = 2\text{ mA}$	145		°C
$V_{F(ON)}$	Flag Output Saturation Voltage	$T_J = T_{JW}$, $I_L = 2\text{ mA}$	0.15		V
$I_{F(OFF)}$	Flag Output Leakage	$V_F = 12V$	0.2	10	μA (max)
T_{JSD}	Shutdown Temperature	Outputs Turn OFF	170		°C
I_S	Quiescent Supply Current	All Logic Inputs Low	13	25	mA (max)
$t_{D(ON)}$	Output Turn-On Delay Time	Sourcing Outputs, $I_{OUT} = 3A$ Sinking Outputs, $I_{OUT} = 3A$	300 300		ns ns
t_{ON}	Output Turn-On Switching Time	Bootstrap Capacitor = 10 nF Sourcing Outputs, $I_{OUT} = 3A$ Sinking Outputs, $I_{OUT} = 3A$	100 80		ns ns
$t_{D(OFF)}$	Output Turn-Off Delay Times	Sourcing Outputs, $I_{OUT} = 3A$ Sinking Outputs, $I_{OUT} = 3A$	200 200		ns ns
t_{OFF}	Output Turn-Off Switching Times	Bootstrap Capacitor = 10 nF Sourcing Outputs, $I_{OUT} = 3A$ Sinking Outputs, $I_{OUT} = 3A$	75 70		ns ns
t_{PW}	Minimum Input Pulse Width	Pins 3, 4 and 5	1		μs
t_{CPR}	Charge Pump Rise Time	No Bootstrap Capacitor	20		μs

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: See Application Information for details regarding current limiting.

Note 3: The maximum power dissipation must be derated at elevated temperatures and is a function of $T_{J(max)}$, θ_{JA} , and T_A . The maximum allowable power dissipation at any temperature is $P_{D(max)} = (T_{J(max)} - T_A)/\theta_{JA}$, or the number given in the Absolute Ratings, whichever is lower. The typical thermal resistance from junction to case (θ_{JC}) is 1.0°C/W and from junction to ambient (θ_{JA}) is 30°C/W. For guaranteed operation $T_{J(max)} = 125^\circ\text{C}$.

Note 4: Human-body model, 100 pF discharged through a 1.5 k Ω resistor. Except Bootstrap pins (pins 1 and 11) which are protected to 1000V of ESD.

Note 5: 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 6: Output currents are pulsed ($t_W < 2\text{ ms}$, Duty Cycle $< 5\%$).