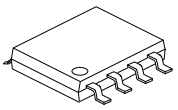
UMD9130

CMOS IC

DC MOTOR DRIVE CIRCUIT



SOP-8

■ DESCRIPTION

UTC **UMD9130** is an integrated DC motor drive solution for applications such as 12V powered fan motor and stepper motor. It has H bridge driver and uses the PMOS and NMOS power transistors with low output resistance. The circuit has a wide working voltage range (from 8V to 18V), the maximum continuous output current reaches 0.5A, and the maximum peak output current reaches 1.0A.

UTC **UMD9130** has on-chip temperature protection function. When the load current through the drive circuit is much greater than the maximum continuous current of the circuit, limited by the package heat dissipation capacity, the junction temperature of the chip inside the circuit will rise rapidly. When the chip temperature exceeds a maximum temperature point (typically 150°C) set by internal temperature protection circuit, the internal circuit will switch off the on-chip power switching transistor of UTC **UMD9130**, and switch off load current, preventing potential safety hazards such as fuming, igniting, etc. Of plastic package caused by over temperature .Only after having confirmed that the circuit has returned to safety temperature, can the on-chip temperature hysteresis circuit be allowed to re-control the circuit.

■ FEATURES

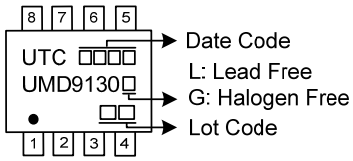
* Low standby current
* Low static operational current
* Integrated H-bridge drive circuit
* Built-in anti-common-state conduction circuit
* Low-on-resistance power MOSFET
* Built-in thermal protection circuit (TSD) with hysteresis

■ ORDERING INFORMATION

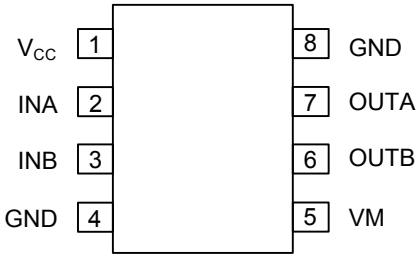
Ordering Number		Package	Packing
Lead Free	Halogen Free		
UMD9130L-S08-R	UMD9130G-S08-R	SOP-8	Tape Reel

UMD9130G-S08-R (1)Packing Type (2)Package Type (3)Green Package	(1) R: Tape Reel (2) S08: SOP-8 (3) G: Halogen Free and Lead Free, L: Lead Free

■ MARKING



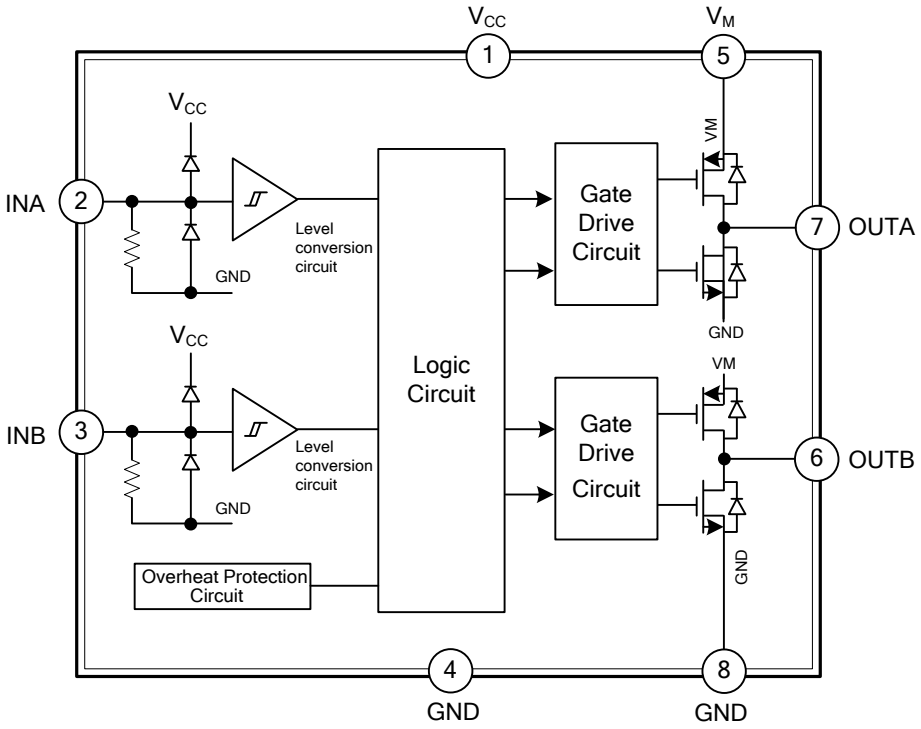
■ PIN CONFIGURATION



■ PIN DESCRIPTION

PIN NO.	PIN NAME	DESCRIPTION
1	V_{CC}	Logic Power supply
2	INA	Forward logic input
3	INB	Reverse logical input
4	GND	Ground
5	VM	Motor power supply
6	OUTB	Reverse output
7	OUTA	Forward output
8	GND	Ground

■ BLOCK DIAGRAM



■ LOGIC TRUTH TABLE

INA	INB	OUTA	OUTB	FUNCTION
L	L	Z	Z	Standby (Stop)
H	L	H	L	Forward rotation
L	H	L	H	Backward rotation
H	H	L	L	Brake

■ ABSOLUTE MAXIMUM RATING (T_A=25°C, unless otherwise specified)

PARAMETER	SYMBOL	RATINGS	UNIT
Maximum Logic Power Supply Voltage Range	V_{CC}	6	V
Maximum Motor Power Supply Voltage Range	V_M	20	V
Maximum External Output Voltage	V_{OUT}	VM	V
Maximum External Input Voltage	V_{IN}	V_{CC}	V
Maximum Peak Output Current	$I_{OUT(PEAK)}$	1	A
Maximum Power Consumption	P_D	1	W
Junction to Ambient	θ_{JAS}	125	°C/W
Junction Temperature	T_J	150	°C
Operational Temperature Range	T_{OPR}	-20 ~ +85	°C
Storage Temperature	T_{STG}	-55 ~ +150	°C

Notes: 1. Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.

2. Maximum power dissipation at different ambient can be obtained from the following formula $P_D=(T_J-T_A)/\theta_{JA}$.
   Where T_J is junction temperature with the circuit working, and T_A is the ambient temperature with the circuit working.

3. Method of calculation of circuit power dissipation
   $P=I^2\times R$
   Where P is circuit power dissipation, I is continuous output current, and R is circuit output on-resistance. Circuit power dissipation P must be smaller than maximum power dissipation P_D

■ THERMAL DATA

PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient	θ_{JA}	125	°C/W

■ RECOMMENDED OPERATIONAL CONDITIONS (T_A=25°C)

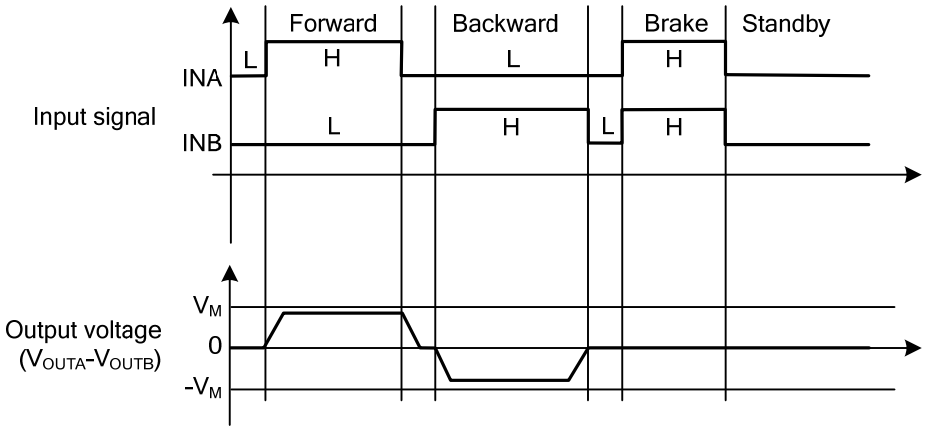
PARAMETER		SYMBOL	MIN	TYP	MAX	UNIT
Maximum Logic and Control Supply Voltage		V_{CC}	3		5.5	V
Motor Power Supply Voltage Range		V_M	8		18	V
Continuous Output Current	VM=8V	I_{OUT}		0.45		A
	VM=12V			0.5		A

Note: Logic control power supply V_{CC} and power supply V_M are fully separate internally, and can supply electricity separately.

■ ELECTRICAL CHARACTERISTICS (T_A=25°C, V_{CC}=5V, V_M=12V, unless otherwise stated)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
THE POWER SUPPLY PARAMETERS						
V_{CC} Standby Current	I_{VCCST}	I_{NA}=I_{NB}=L, V_{CC}=5V		0	10	μA
VM Standby Current	I_{VMST}	V_M=12V, Output Opened		10	30	μA
V_{CC} Static Supply Current	I_{VCC}	I_{NA}=H or I_{NB}=H, Output Opened		170		μA
VM Static Supply Current	I_{VM}	I_{NA}=H or I_{NB}=H, Output Opened		100		μA
INPUT LOGIC LEVEL						
Input High Level	V_{INH}	V_{CC}=5V	0.5×V_{CC}			V
Input Low Level	V_{INL}	V_{CC}=5V			0.6	V
Input Level Hysteresis	V_{HYS}			0.5		V
Input High Level Current	I_{INH}	V_{IN}=5V, V_{CC}=5V		45		μA
Input the Pull-Down Resistor	R_{IN}	V_{IN}=5V, V_{CC}=5V		110		kΩ
THE POWER TUBE LEADS TO INTERNAL RESISTANCE						
Output Resistance	R_{ON}	I_O=±500mA, V_M=12V, T_A=25°C		1.7		Ω
Protection Function Parameters						
Protection Temperature	TSD			150		°C
TSD Hysteresis	TSDH			30		°C
MOTOR DRIVE TIME PARAMETERS						
Output Rise Time	t_r	V_{CC}=5V, V_M=12V, I_{NB}=H, I_{NA} input pulse signal; output is connected to 0.1uF capacitor to ground.		500		ns
Output Fall Time	t_f			500		ns
Output Delay Time	t_{rf}			300		ns
Output Delay Time	t_{fr}			300		ns

■ TYPICAL WAVEFORM



■ APPLICATION INFORMATION

1. Baseline Mode

a) Standby mode

In standby mode, INA=INB=L. All internal circuits, including the drive power tube, are off state. Circuit consumption is extremely low. In this mode, OUTA and OUTB both are in high-impedance state.

b) Forward mode

The forward mode is defined as: INA=H, INB=L, at this point the motor drive end OUTA outputs high level, and the motor drive end OUTB outputs low level, then the motor drives the current into the motor from the OUTA, and out from the OUTB to the ground. This motor rotation mode is defined as the forward mode.

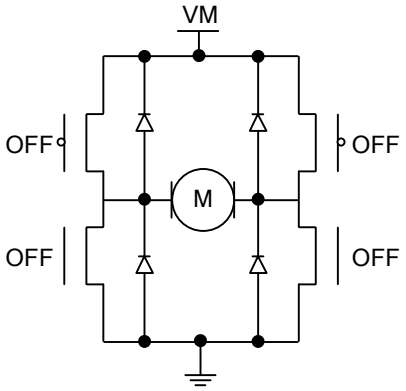
c) Backward mode

The backward mode is defined as: INA=L, INB=H, at this point the motor drive end OUTB outputs high level, and the motor drive end OUTA outputs low level, then the motor drives the current into the motor from the OUTB, and out from the OUTA to the ground. This motor rotation mode is defined as the backward mode.

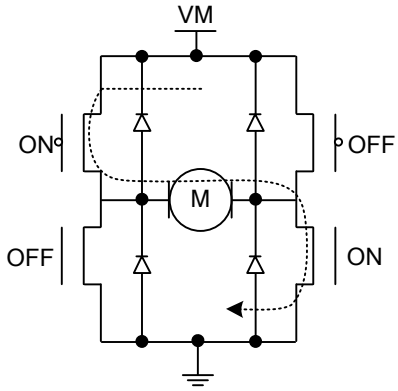
d) Brake mode

The brake mode is defined as: INA=H, INB=H, at this point motor drive ends OUTA and OUTB both output low level, and the energy stored in the motor will be quickly released through the OUTA end's NMOS tube or the OUTB end's NMOS tube, so the motor will stop turning in a short time.

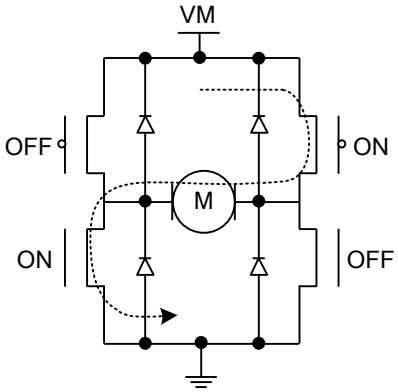
Note: in brake mode, circuit will consume static power.



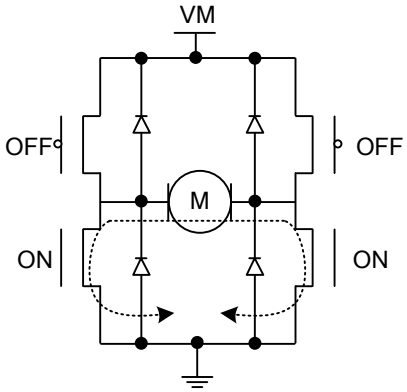
a) Standby mode



b) Forward mode



c) Backward mode



d) Brake mode

■ TYPICAL APPLICATION CIRCUIT