Ordering number : ENN*6192

Monolithic Digital IC

LB1947

PWM Current Control Type DC Motor Driver

Preliminary

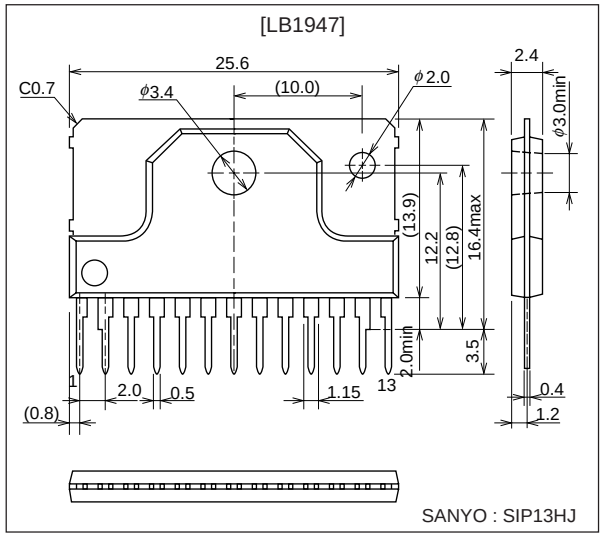
Features

- PWM current control (fixed OFF time)
- Selectable current decay pattern (FAST, SLOW, and MIX DECAY modes)
- Simultaneous ON prevention function (feedthrough current prevention)
- Built-in thermal shutdown circuit
- Built-in noise canceler

Package Dimensions

unit: mm

3249-SIP13HJ



Specifications

Absolute Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum motor supply voltage	V_{BB} max		50	V
Output peak current	I_{OPEAK}	tw ≤ 20 μs	2.25	A
Output continuous current	I_O max		2.0	A
Logic supply voltage	V_{CC} max		7.0	V
Logic input voltage range	V_{IN}		–0.3 to V_{CC}	V
Emitter output voltage	V_E max		1.1	V
Reference voltage	V_{REF}		–0.3 to V_{CC}	V
Operating temperature	Topr		–20 to +85	°C
Storage temperature	Tstg		–55 to +150	°C
Allowable power dissipation	Pd max	Ta = 25°C	1.6	W

Allowable Operating Ranges at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Motor supply voltage	V_{BB}		10 to 45	V
Logic supply voltage	V_{CC}		4.75 to 5.25	V
Reference voltage	V_{REF}		0 to (Vcc–2)	V

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SANYO Electric Co.,Ltd. Semiconductor Company

TOKYO OFFICE Tokyo Bldg., 1-10, 1 Chome, Ueno, Taito-ku, TOKYO, 110-8534 JAPAN

Electrical Characteristics at Ta = 25°C, V_{BB} = 42V, V_{CC} = 5V, V_{REF} = 1.0V

	Parameter	Symbol	Conditions	Ratings			Unit
				min	typ	max	
Output Block	Output stage supply current	$I_{BB\ ON}$	No-load state	0.4	0.6	1.0	mA
		$I_{BB\ BR}$	No-load state	0.2	0.4	0.8	mA
		$I_{BB\ OFF}$	No-load state	0.2	0.4	0.8	mA
		I_{BBwt}	No-load state			0.1	mA
	Output saturation voltage 1	V osat 1	Io = +1.0A sink		1.2	1.5	V
	2	V osat 2	Io = +2.0A sink		1.6	1.9	V
	3	V osat 3	Io = –1.0A source		1.8	2.2	V
	4	V osat 4	Io = –2.0A source		2.1	2.4	V
	Output leak current	I o1(leak)	V_O = V_{BB} sink			50	µA
		I o2(leak)	V_O = 0V source	–50			µA
	Output sustain voltage	V_{SUS}	L = 3.9 mH Io = 2.0A *1	50			V
Logic Block	Logic supply current	$I_{CC\ ON}$	IN1 : High, IN2 : Low, ST = High	11	16	21	mA
		$I_{CC\ BR}$	IN1 : Low, IN2 : High, ST = High	11	16	21	mA
		$I_{CC\ OFF}$	IN1 : Low, IN2 : Low, ST = High	11	16	21	mA
		I_{CCwt}	ST : Low	1.0	2	3.0	mA
	Input voltage	V_{INH}		2			V
		V_{INL}				0.8	V
	Input current	I_{INH}	V_{IN} = 5V	60	90	120	µA
		I_{INL}	V_{IN} = 0.8V	6	10	13	µA
	Sensing voltage	V_E		0		1.1	V
	Sensing voltage 25H	V_{EH25}	VI = High, V_{REF} = 2.5V	0.970	1.0	1.030	V
	Sensing voltage 25L	V_{EL25}	VI = Low, V_{REF} = 2.5V	0.483	0.5	0.513	V
	Sensing voltage 10H	V_{EH25}	VI = High, V_{REF} = 1.0V	0.385	0.4	0.410	V
	Sensing voltage 10L	V_{EL25}	VI = Low, V_{REF} = 1.0V	0.190	0.2	0.210	V
	Sensing voltage 05H	V_{EH25}	VI = High, V_{REF} = 0.5V	0.190	0.2	0.210	V
	Sensing voltage 05L	V_{EL25}	VI = Low, V_{REF} = 0.5V	0.092	0.1	0.108	V
	Reference current	I ref	Vref = 1.0V	–0.5		0.5	µA
	CR pin current	I_{CR}	CR = 1.0V	–1.56	–1.3	–1.04	mA
	MD pin voltage	V_{MDH}		Vcc–0.3			V
		V_{MDM}		0.3Vcc		Vcc–1.0	V
		V_{MDL}				0.4	V
	MD pin current	I_{MDH}	MD = (Vcc–0.5)V, CR = 1.0V	–1.0		1.0	µA
		I_{MDL}	MD = 0.4V, CR = 2.0V	–5.0			µA
	Thermal shutdown temperature	T SD			170		°C

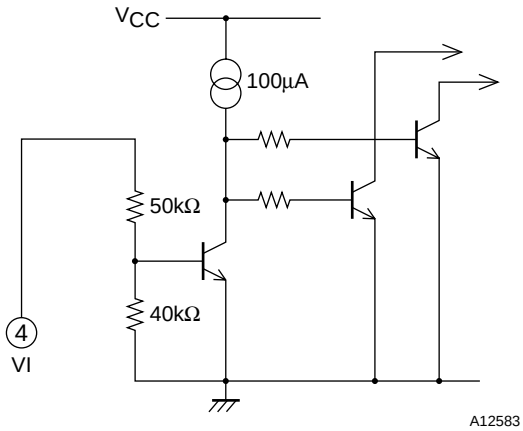
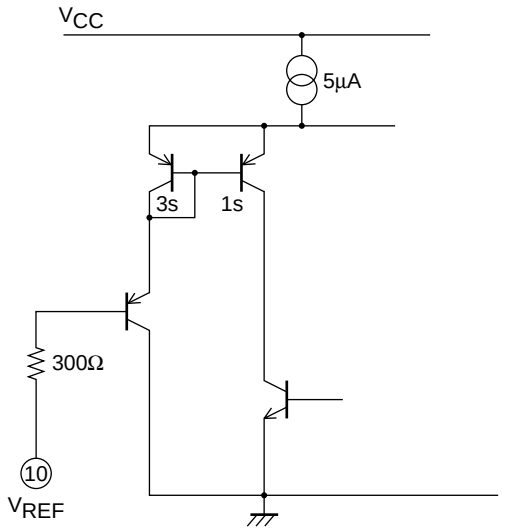
*1: Guaranteed design

Truth Table

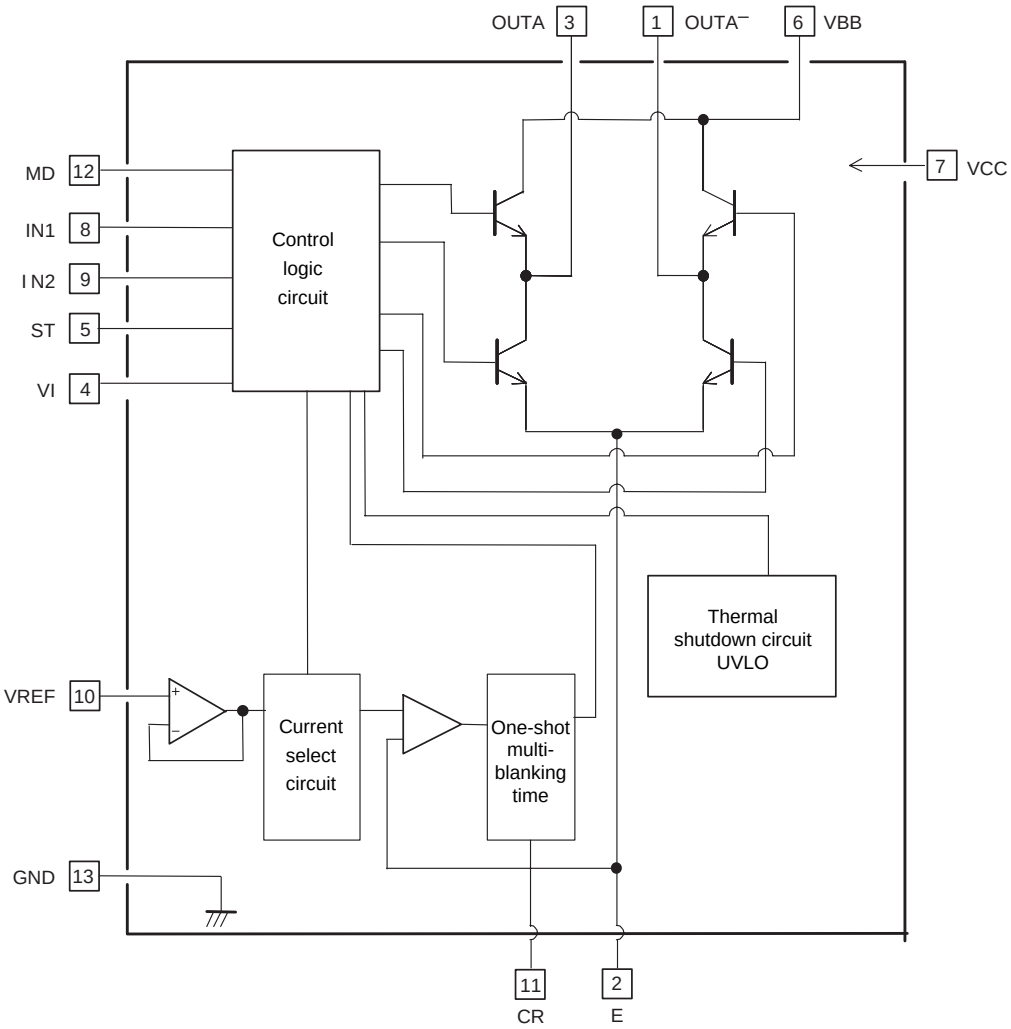
IN 1	IN 2	ST	VI	MD	OUT	OUT–	Operating mode
H	L	H	H	L	H	L	Forward, 2/5 times, FAST
H	L	H	H	M	H	L	Forward, 2/5 times, MIX
H	L	H	H	H	H	L	Forward, 2/5 times, SLOW
H	L	H	L	L	H	L	Forward, 1/5 times, FAST
H	L	H	L	M	H	L	Forward, 1/5 times, MIX
H	L	H	L	H	H	L	Forward, 1/5 times, SLOW
H	H	H	H	L	L	H	Reverse, 2/5 times, FAST
H	H	H	H	M	L	H	Reverse, 2/5 times, MIX
H	H	H	H	H	L	H	Reverse, 2/5 times, SLOW
H	H	H	L	L	L	H	Reverse, 1/5 times, FAST
H	H	H	L	M	L	H	Reverse, 1/5 times, MIX
H	H	H	L	H	L	H	Reverse, 1/5 times, SLOW
L	H	H	H	L	L	L	Brake, 2/5 times, FAST
L	H	H	H	M	L	L	Brake, 2/5 times, MIX
L	H	H	L	L	L	L	Brake, 1/5 times, FAST
L	H	H	L	M	L	L	Brake, 1/5 times, MIX
L	H	H	X	H	L	L	Brake, no current limiting
L	L	H	X	X	OFF	OFF	Output OFF
X	X	L or OPEN	X	X	OFF	OFF	Standby mode (circuit OFF)

Except for MD pin, Low at input OPEN MD M: determined by external voltage

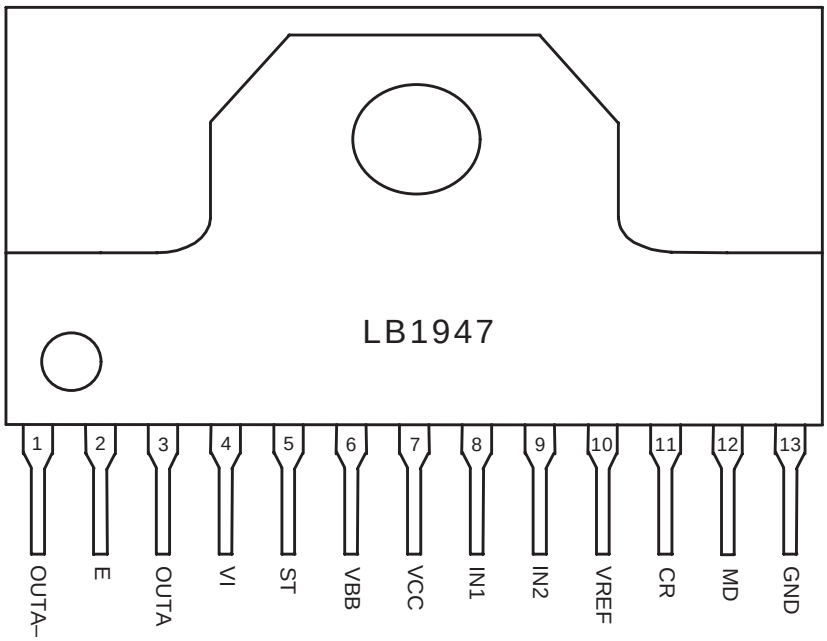
Pin Description

Pin number	Pin name	Equivalent circuit	Pin function
1 3	OUTA– OUTA		Output pin
2	E		Sense voltage control pin
4 5 8 9	VI ST IN1 IN2		VI High : sense voltage is 2/5 of V_{REF} Low : sense voltage is 1/5 of V_{REF} ST High : circuit operation ON Low : standby mode IN1 High : rotation mode Low : brake mode IN2 High : reverse mode Low : forward mode
6	VBB		Motor power supply voltage
7	VCC		Logic power supply voltage
10	VREF		Output current setting reference pin Setting range: 0 to (Vcc–2V)
11	CR		Oscillator with self-excitation
12	MD		Current attenuation switching pin Low : FAST DECAY High : SLOW DECAY M : MIX DECAY M is set by external power supply voltage. Range : 1.1 to 4.0V
13	GND		Ground pin

Block Diagram

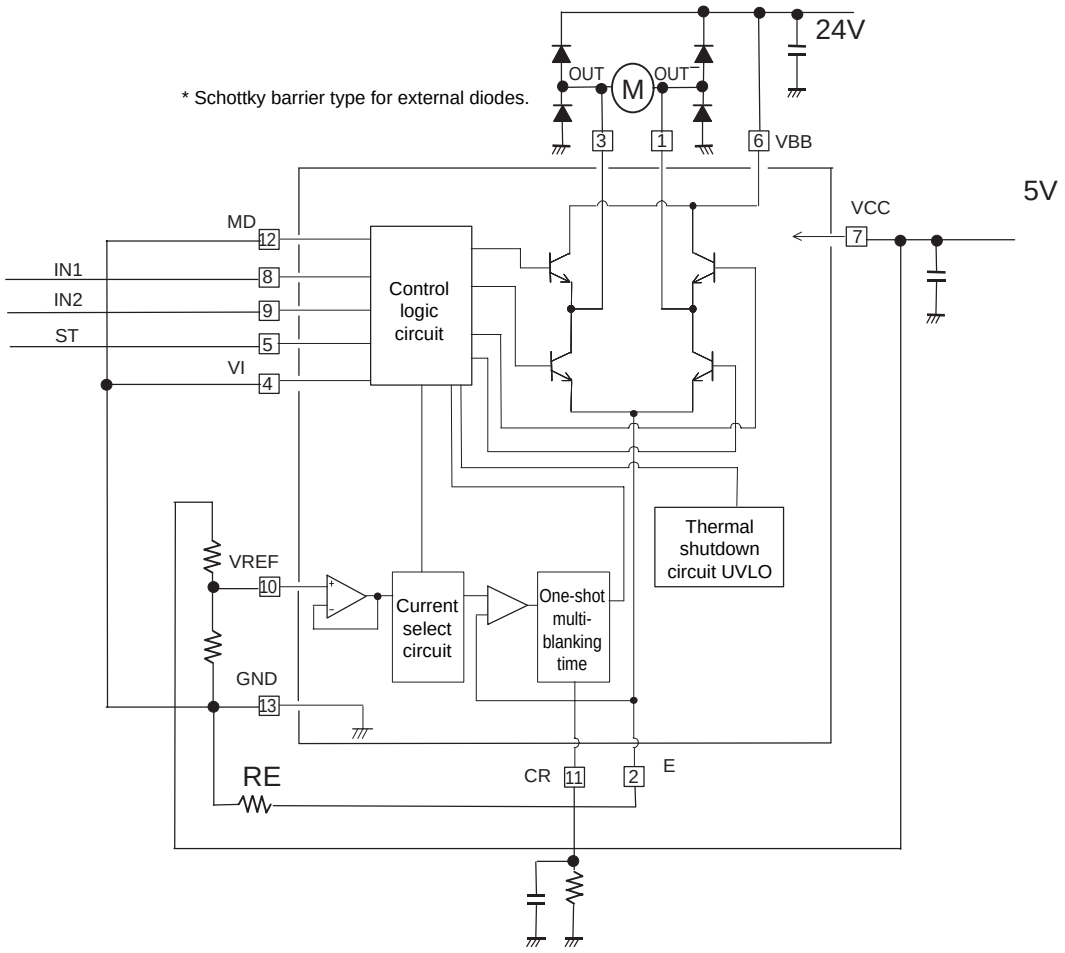


Pin Assignment



Sample Application Circuits

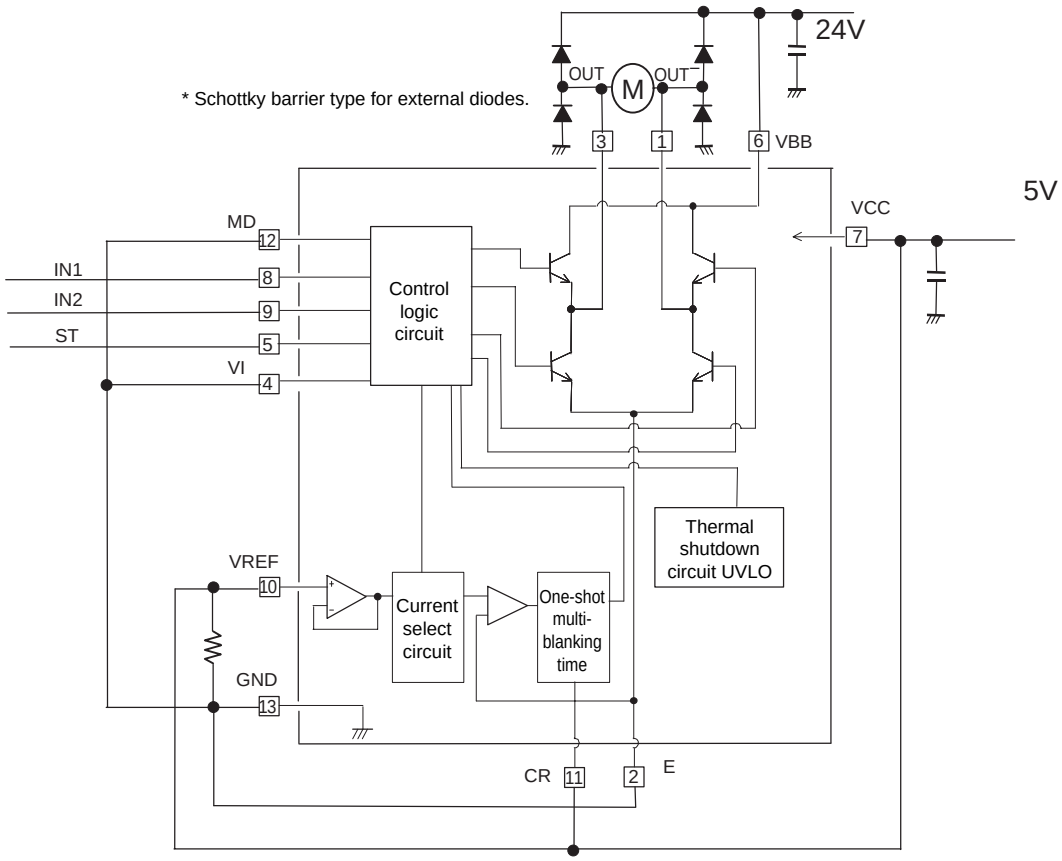
1. Forward/reverse motor with current limiter



Limiter current setting method $I = V_{REF} / (5 \times RE)$

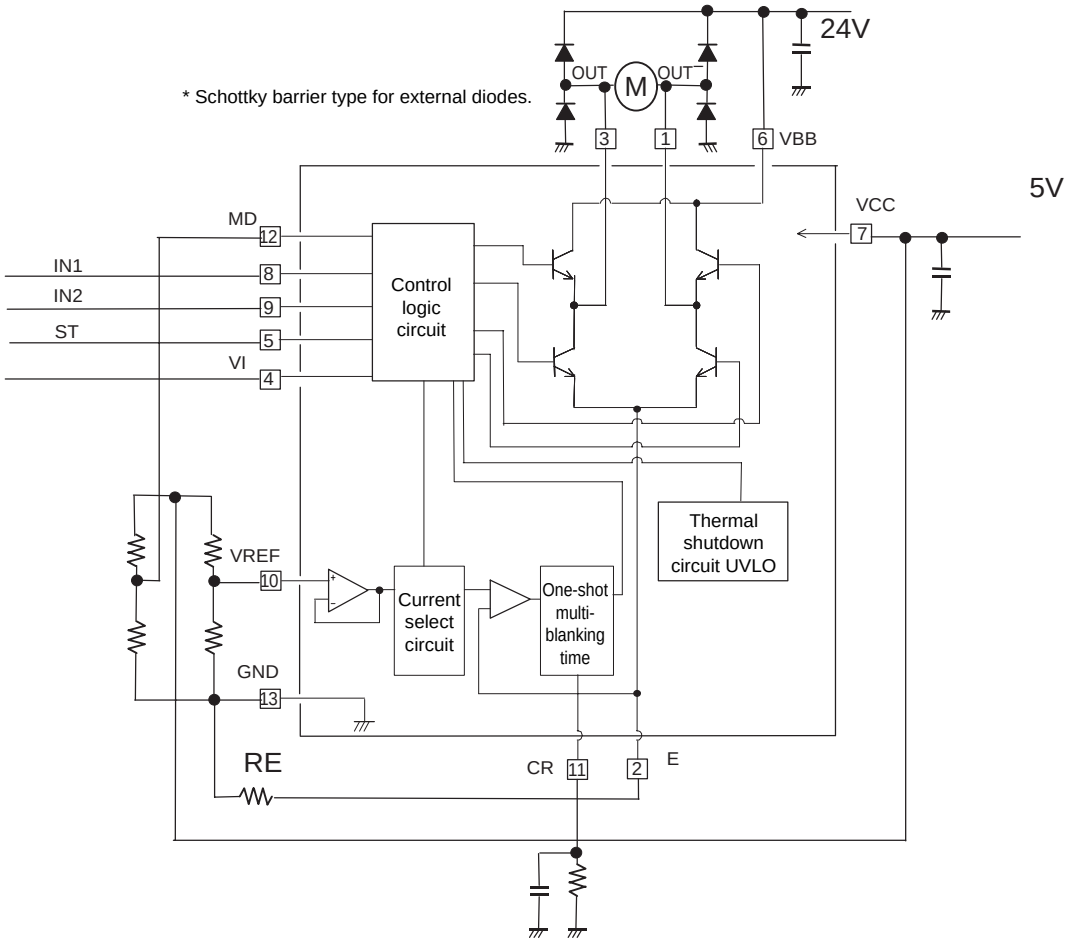
IN1	IN2	ST	OUT	OUT–	Mode
H	H	H	L	H	Reverse
H	L	H	H	L	Forward
L	H	H	L	L	Brake
L	L	H	OFF	OFF	Output OFF
–	–	L	OFF	OFF	Standby mode

2. Forward/reverse motor



IN1	IN2	ST	OUT	OUT–	Mode
H	H	H	L	H	Reverse
H	L	H	H	L	Forward
L	H	H	L	L	Brake
L	L	H	OFF	OFF	Output OFF
–	–	L	OFF	OFF	Standby mode

3. PWM current control forward/reverse motor (MIX DECAY)



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