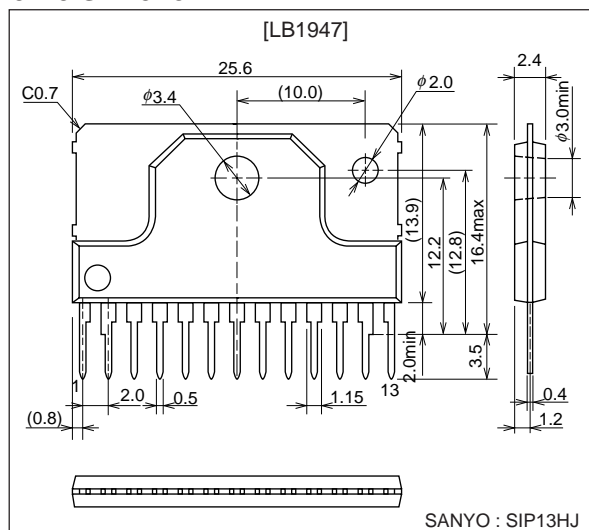


**LB1947****PWM Current Control Type DC Motor Driver****Preliminary****Features**

- 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	T _{opr}		-20 to +85	°C
Storage temperature	T _{stg}		-55 to +150	°C
Allowable power dissipation	P _d 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 (V _{CC} -2)	V

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Electrical Characteristics at Ta = 25°C, VBB = 42V, VCC = 5V, VREF = 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	V _{osat 1}	I _o = +1.0A sink		1.2	1.5	V
		V _{osat 2}	I _o = +2.0A sink		1.6	1.9	V
		V _{osat 3}	I _o = -1.0A source		1.8	2.2	V
		V _{osat 4}	I _o = -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 I _o = 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}	V _I = High, V _{REF} = 2.5V	0.970	1.0	1.030	V
	Sensing voltage 25L	V _{EL25}	V _I = Low, V _{REF} = 2.5V	0.483	0.5	0.513	V
	Sensing voltage 10H	V _{EH25}	V _I = High, V _{REF} = 1.0V	0.385	0.4	0.410	V
	Sensing voltage 10L	V _{EL25}	V _I = Low, V _{REF} = 1.0V	0.190	0.2	0.210	V
	Sensing voltage 05H	V _{EH25}	V _I = High, V _{REF} = 0.5V	0.190	0.2	0.210	V
	Sensing voltage 05L	V _{EL25}	V _I = Low, V _{REF} = 0.5V	0.092	0.1	0.108	V
	Reference current	I _{ref}	V _{ref} = 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}		V _{CC} -0.3			V
		V _{MDM}		0.3V _{CC}		V _{CC} -1.0	V
		V _{MDL}				0.4	V
MD pin current	I _{MDH}	MD = (V _{CC} -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	V _I	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

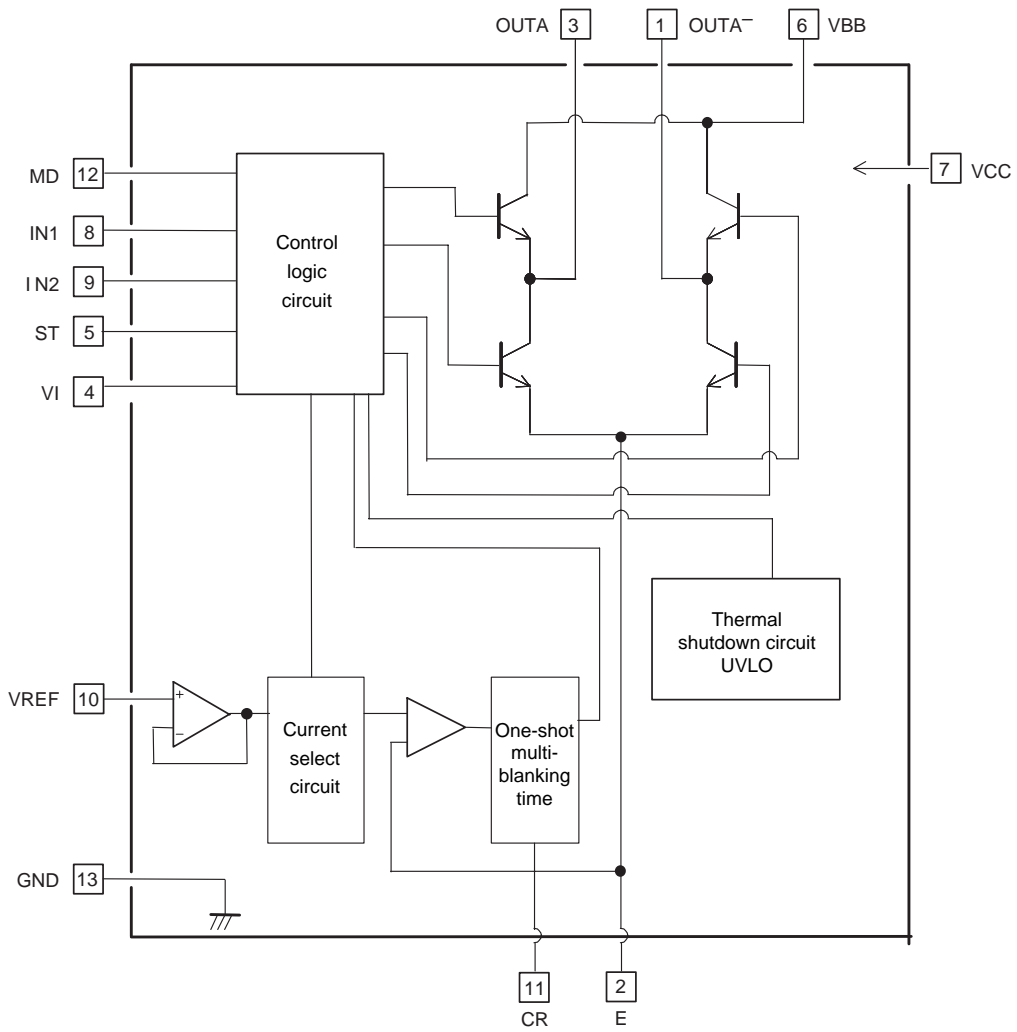
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Pin Description

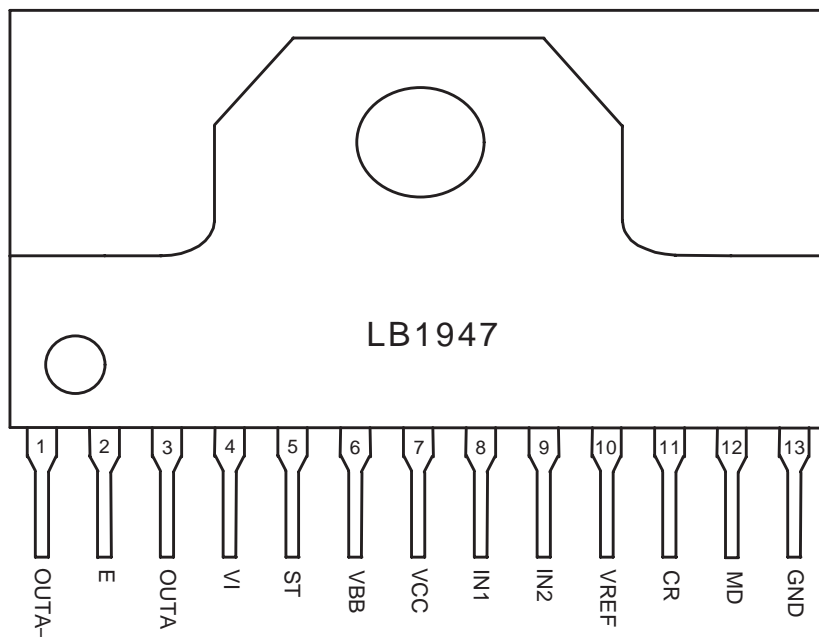
Pin number	Pin name	Equivalent circuit	Pin function
1 3	OUTA- OUTA		Output pin
2	E		Sense voltage control pin
4 5 8 9	VI ST IN1 IN2		<p>VI</p> <p>High : sense voltage is 2/5 of V_{REF} Low : sense voltage is 1/5 of V_{REF}</p> <p>ST</p> <p>High : circuit operation ON Low : standby mode</p> <p>IN1</p>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

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Block Diagram

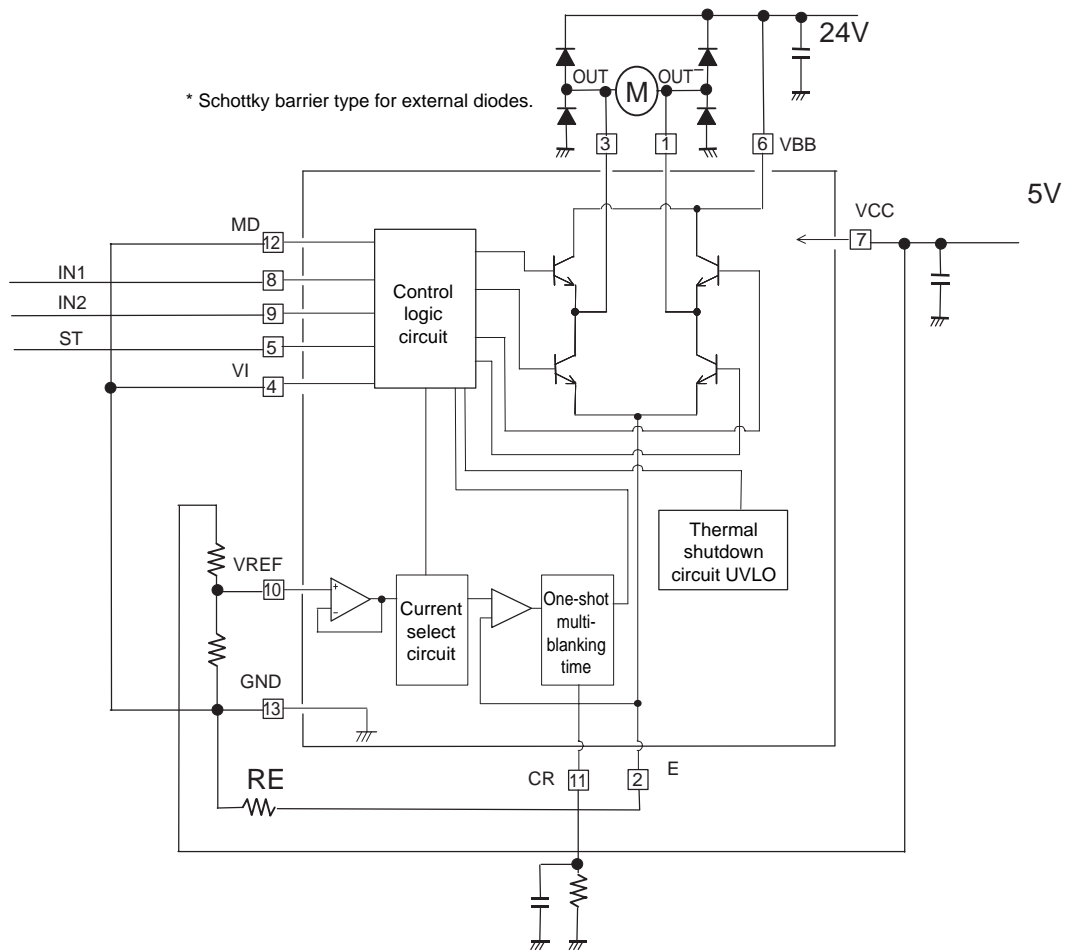


Pin Assignment



Sample Application Circuits

1. Forward/reverse motor with current limiter

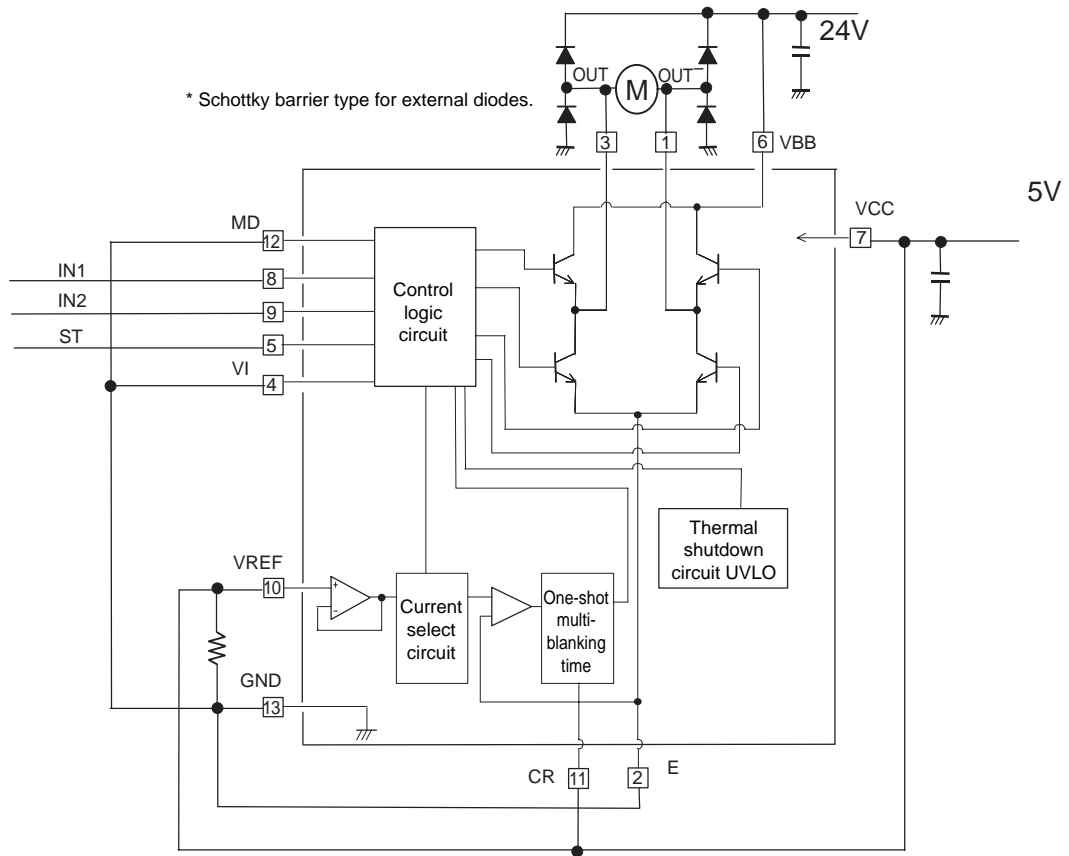


Limiter current setting method $I = V_{REF} / (5 \times RE)$

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

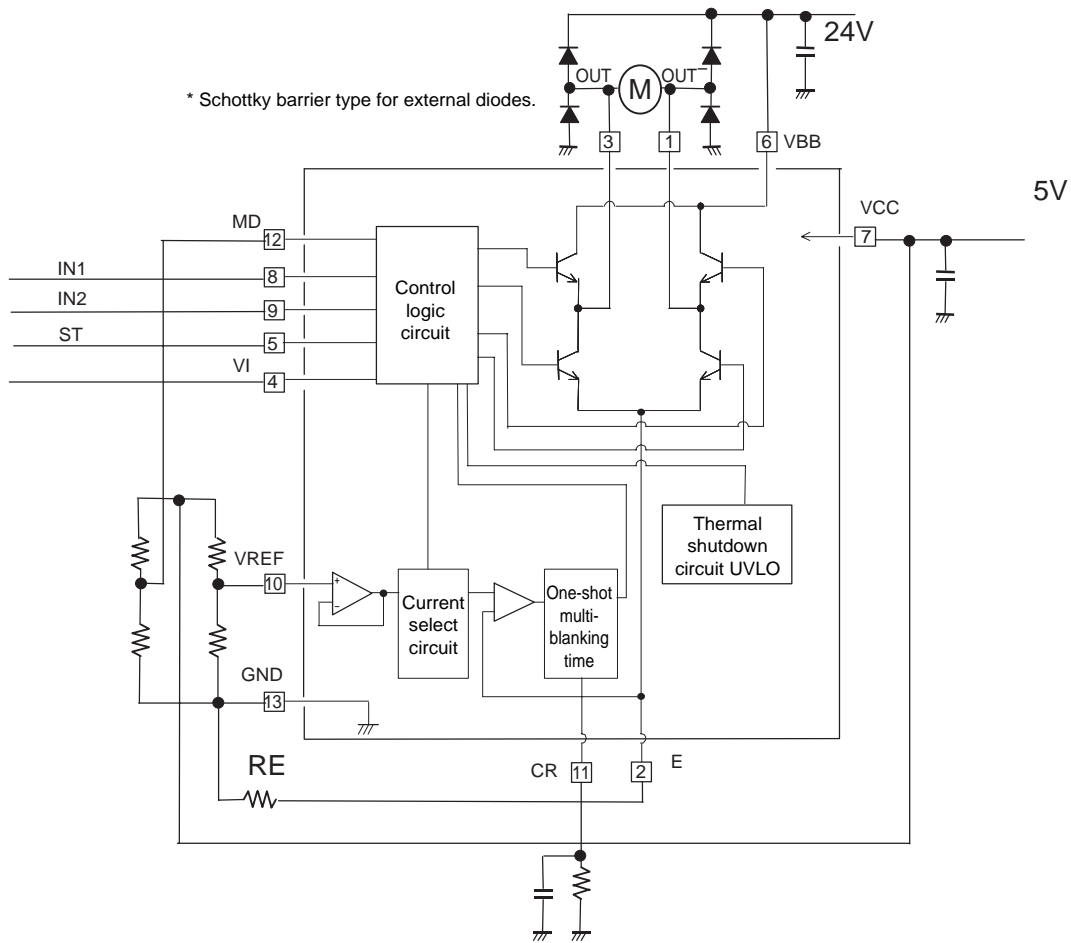
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2. Forward/reverse motor



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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