



LB1945H

PWM Current Control Type Stepping Motor Driver

Preliminary

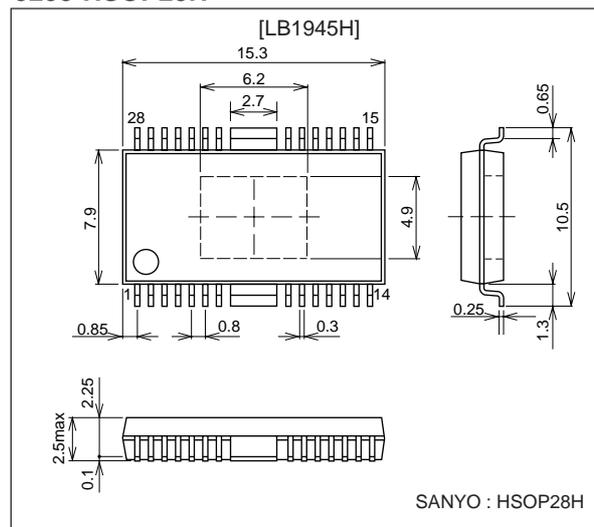
Features

- PWM current control (external excitation)
- Load current digital selection (1-2, W1-2, and 2 phase excitation drives possible)
- Built-in upper/lower diode
- Simultaneous ON prevention function (feedthrough current prevention)
- Built-in thermal shutdown circuit
- Built-in noise canceler

Package Dimensions

unit: mm

3233-HSOP28H



Specifications

Absolute Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum motor supply voltage	V _{BB} max		30	V
Output peak current	I _{OPEAK}	tw ≤ 20 μs	1.0	A
Output continuous current	I _O max		0.8	A
Logic supply voltage	V _{CC} max		6.0	V
Logic input voltage range	V _{IN} max		-0.3 to V _{CC}	V
Emitter output voltage	V _E max		1.0	V
Allowable power dissipation	P _d max	Ta = 25°C, with specified substrate*	1.9	W
Operating temperature	T _{opr}		-20 to +90	°C
Storage temperature	T _{stg}		-55 to +150	°C

* Specified substrate: 114.3 × 76.1 × 1.6 mm³, glass epoxy

Allowable Operating Ranges at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Motor supply voltage	V _{BB}		10 to 28	V
Logic supply voltage	V _{CC}		4.75 to 5.25	V
Reference voltage	V _{REF}		1.5 to 5.0	V

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Electrical Characteristics at $T_a = 25^\circ\text{C}$, $V_{BB} = 24\text{V}$, $V_{CC} = 5\text{V}$, $V_{REF} = 5.0\text{V}$

Parameter	Symbol	Conditions	Ratings			Unit			
			min	typ	max				
Output Block	Output stage supply current	$I_{BB\ ON}$	$I_1 = 0.8\text{V}$, $I_2 = 0.8\text{V}$, $\text{ENABLE} = 0.8\text{V}$			0.5	1.0	2.0	mA
		$I_{BB\ OFF}$	$\text{ENABLE} = 3.2\text{V}$					0.2	mA
	Output saturation voltage	Vosat 1	$I_o = +0.5\text{A}$ sink		0.3	0.5	V		
		Vosat 2	$I_o = +0.8\text{A}$ sink		0.5	0.7	V		
		Vosat 3	$I_o = -0.5\text{A}$ source		1.6	1.8	V		
		Vosat 4	$I_o = -0.8\text{A}$ source		1.8	2.0	V		
	Output leakage current	$I_{o1}(\text{leak})$	$V_o = V$ sink				50	μA	
		$I_{o2}(\text{leak})$	$V_o = 0\text{V}$ source	-50				μA	
Output sustain voltage	V_{SUS}	$L = 3.9\text{mH}$ $I_o = 1.0\text{A}$ *1	30				V		
Logic Block	Logic supply current	$I_{CC\ ON}$	$I_1 = 0.8\text{V}$, $I_2 = 0.8\text{V}$, $\text{ENABLE} = 0.8\text{V}$			50.0	70.0	92.0	mA
		$I_{CC\ OFF}$	$\text{ENABLE} = 3.2\text{V}$			7.0	10.0	13.0	mA
	Input voltage	V_{IH}		3.2				V	
		V_{IL}				0.8		V	
	Input current	I_{IH}	$V_{IH} = 3.2\text{V}$	35	50	65	μA		
		I_{IL}	$V_{IL} = 0.8\text{V}$	7	10	13	μA		
	Set current control threshold value	V_{ref}/V_{sen}	$I_1 = 0.8\text{V}$, $I_2 = 0.8\text{V}$	9.5	10	10.5			
			$I_1 = 3.2\text{V}$, $I_2 = 0.8\text{V}$	13.5	15	16.5			
			$I_1 = 0.8\text{V}$, $I_2 = 3.2\text{V}$	25.5	30	34.5			
	Reference current	I_{ref}	$V_{ref} = 5.0\text{V}$, $I_1 = 0.8\text{V}$, $I_2 = 0.8\text{V}$	17.5	25	32.5	μA		
CR pin current	I_{CR}	$\text{CR} = 1.0\text{V}$	-1.0				mA		
Thermal shutdown temperature	T_{TSD}			170		$^\circ\text{C}$			
Temperature hysteresis width	ΔT_{TSD}			40		$^\circ\text{C}$			

*1: Assured design target value, not measured

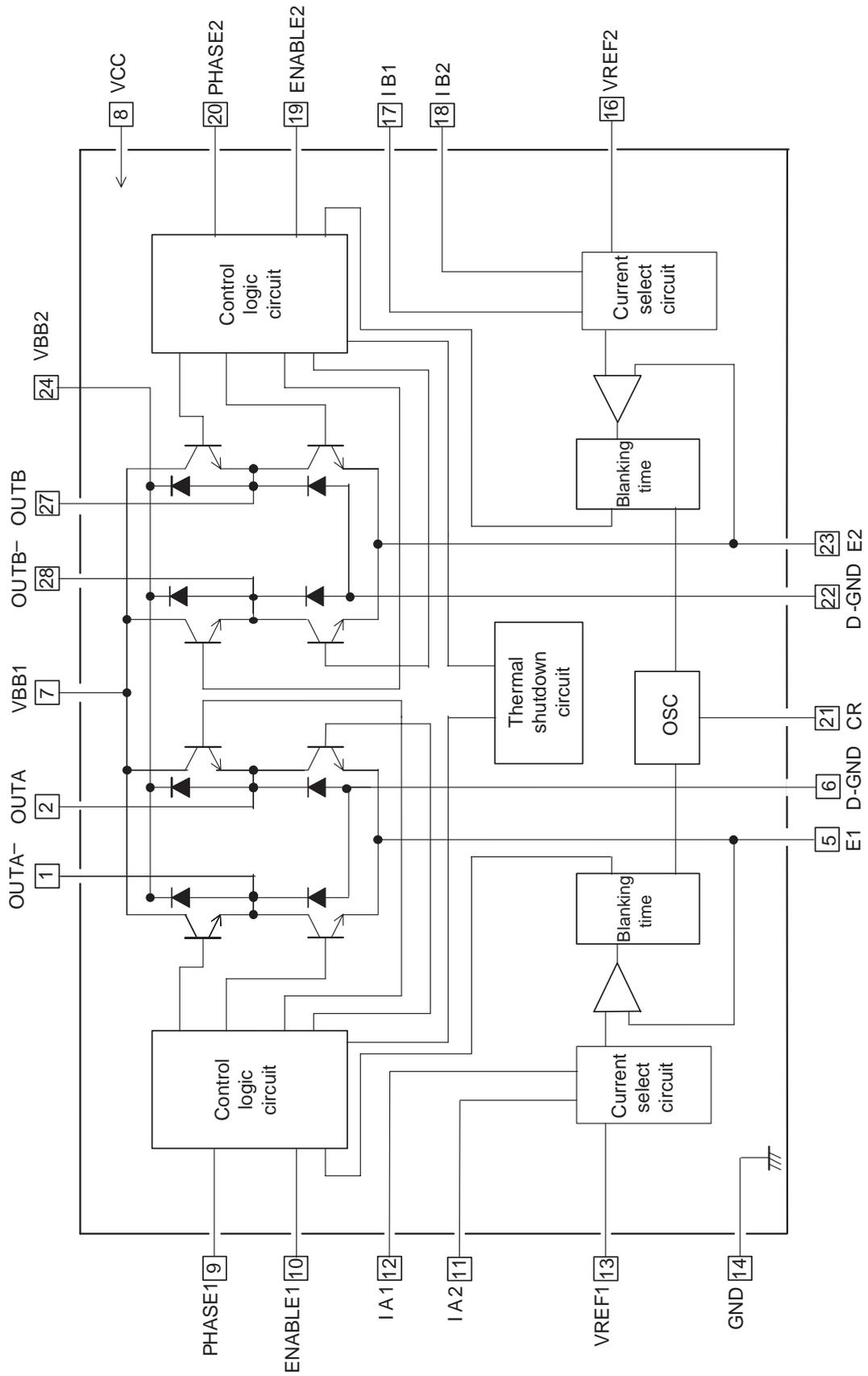
Truth Table

ENABLE	PHASE	OUTA	OUTA ⁻
L	H	H	L
L	L	L	H
H	-	OFF	OFF

I1	I2	Output current
L	L	$V_{ref} / (10 \times R_E) = I_{OUT}$
H	L	$V_{ref} / (15 \times R_E) = I_{OUT} \times 2/3$
L	H	$V_{ref} / (30 \times R_E) = I_{OUT} \times 1/3$
H	H	0

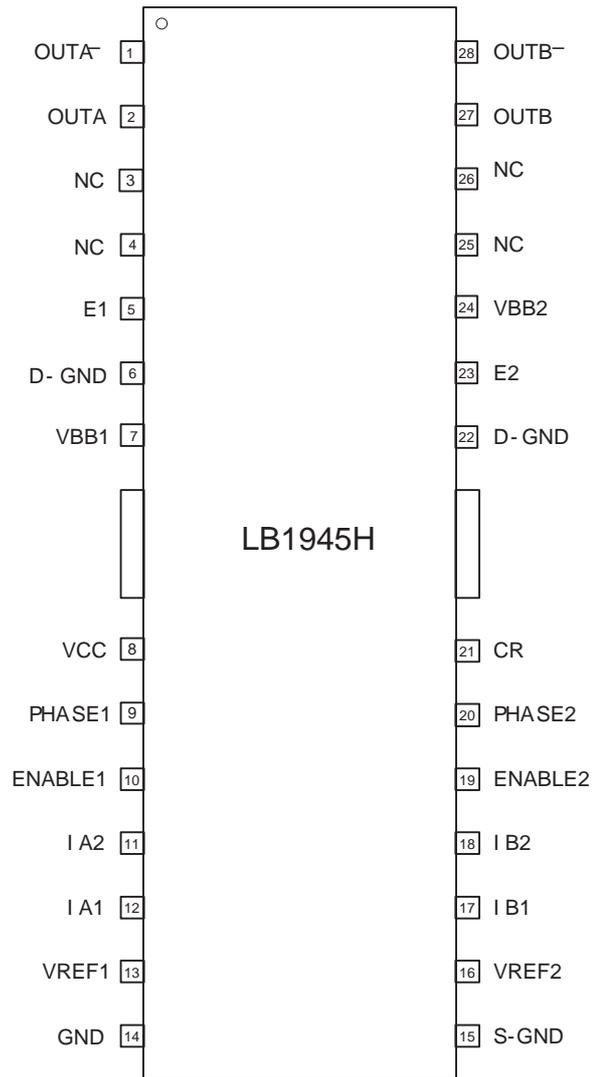
Note: Output is OFF when ENABLE = H or when I1 = I2 = H.

Block Diagram



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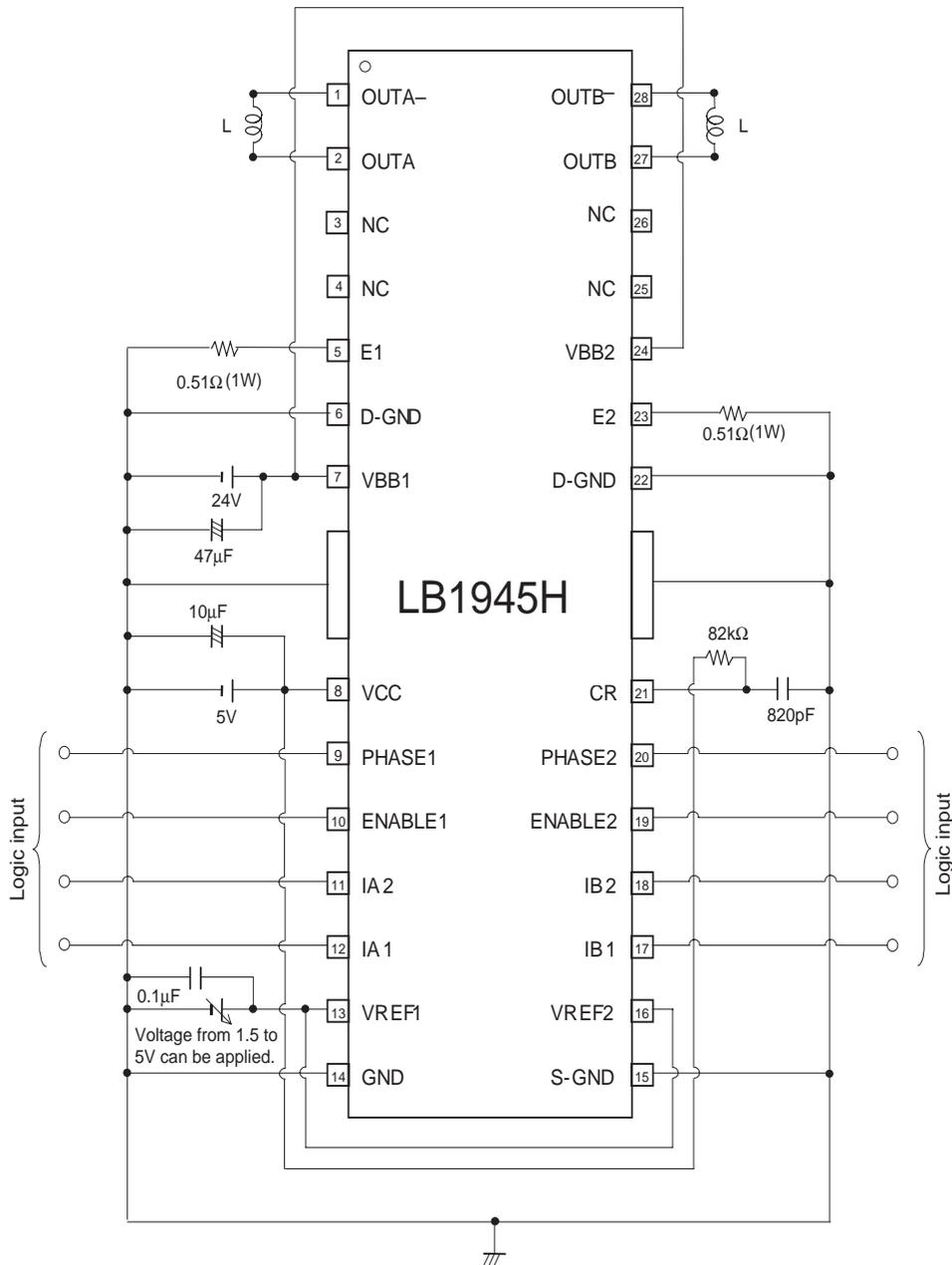
Pin Assignment



Top view

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Sample Application Circuit



The fin on the bottom of HSOP-28H package and the fins between pins 7 and 8 and 21 and 22 should be grounded.

Pin Description

Pin name	Pin number	Function
V _{BB1}	7	Output stage power supply voltage pin.
V _{BB2}	24	Cathode pin for the upper-side diodes.
E1	5	Insert resistor R _E between these pins and ground to control set current.
E2	23	
OUTA	2	Output pins.
OUTA ⁻	1	
OUTB	27	
OUTB ⁻	28	
GND	14	Ground pin.
S-GND	15	Sense ground pin.
D-GND	6	Lower-side internal diode ground (anode)
	22	
CR	21	Triangular wave chopping with CR constant setting.
		Triangular wave OFF time is noise cancel time.
V _{REF1}	13	Output current setting pins. (Output current is set by inputting a 1.5V to 7.5V voltage.)
V _{REF2}	16	
PHASE1	9	Output phase select input pin.
PHASE2	20	High input: OUTA = H, OUTA ⁻ = L
		Low input: OUTA = L, OUTA ⁻ = H
ENABLE1	10	Output ON/OFF setting input pins. High input: output OFF Low input: output ON
ENABLE2	19	
IA1, IA2	12, 11	Output current setting digital input pins.
IB1, IB2	17, 18	Current is set to 1/3, 2/3, 1 by High and Low combinations.
V _{CC}	8	Logic block power supply voltage pin.

Usage Notes

1. V_{REF} pin

Because the V_{REF} pin is used as reference voltage input pin for the current setting, care must be taken to prevent noise from affecting the input.

2. GND pin

Because this IC switches large currents, the ground pattern must be designed with care. The fin on the bottom of the package and the fins between pins 7 and 8 and 21 and 22 should be grounded. Low-impedance patterns should be used in blocks where large currents flow, and these blocks should be separated from low-level signal blocks. In particular, the ground of the sense resistor R_E at pin E should be located close to the IC ground. Pattern layout should be designed so that the capacitors between V_{CC} and ground and V_{BB} and ground are close to V_{CC} and V_{BB}.

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