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LB1945H

ON Semiconductor®

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Monolithic Digital IC

PWM Current Control Type
Stepping Motor Driver

Overview

The LB1945H is a PWM current control type stepping motor driver.

Feature

- 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 (feed-through current prevention)
- Built-in thermal shutdown circuit
- Built-in noise canceler

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_O peak	$t_W \leq 20\mu s$	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	Pd max	Mounted on a specified board *	1.9	W
Operating temperature	Topr		-20 to +90	°C
Storage temperature	Tstg		-55 to +150	°C

* Specified board: 114.3mm × 76.1mm × 1.6mm, glass epoxy board.

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

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

Electrical Characteristics at Ta = 25°C, V_{BB} = 24V, V_{CC} = 5V, V_{REF} = 5.0V

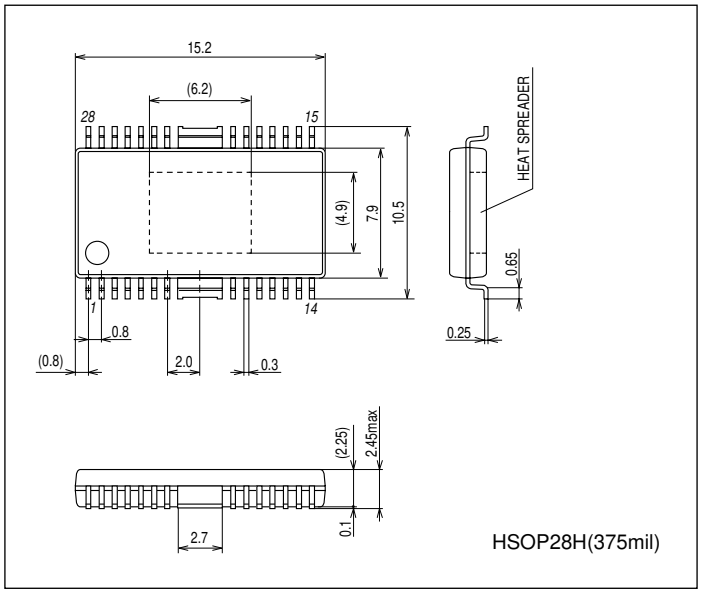
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Output Block						
Output stage supply current	I_{BB} ON	I_1 = 0.8V, I_2 = 0.8V, ENABLE = 0.8V	0.5	1.0	2.0	mA
	I_{BB} OFF	ENABLE = 3.2V			0.2	mA
Output saturation voltage	$V_O$sat1	I_O = +0.5A, sink		0.3	0.5	V
	$V_O$sat2	I_O = +0.8A, sink		0.5	0.7	V
	$V_O$sat3	I_O = -0.5A, source		1.6	1.8	V
	$V_O$sat4	I_O = -0.8A, source		1.8	2.0	V
Output leakage 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 = 3.9mH, I_O = 1.0A, Design guarantee value *	30			V
Logic Block						
Logic supply current	I_{CC} ON	I_1 = 0.8V, I_2 = 0.8V, ENABLE = 0.8V	50	70	92	mA
	I_{CC} OFF	ENABLE = 3.2V	7	10	13	mA
Input voltage	V_{IH}		3.2			V
	V_{IL}				0.8	V
Input current	I_{IH}	V_{IH} = 3.2V	35	50	65	μA
	I_{IL}	V_{IL} = 0.8V	7	10	13	μA
Set current control threshold value	Vref/Vsen	I_1 = 0.8V, I_2 = 0.8V	9.5	10	10.5	
		I_1 = 3.2V, I_2 = 0.8V	13.5	15	16.5	
		I_1 = 0.8V, I_2 = 3.2V	25.5	30	34.5	
Reference current	Iref	Vref = 5.0V, I_1 = 0.8V, I_2 = 0.8V	17.5	25	32.5	μA
CR pin current	I_{CR}	CR = 1.0V	-1.0			mA
Thermal shutdown temperature	T-TSD	Design guarantee value *		170		°C
Temperature hysteresis width	Ts hys			40		°C

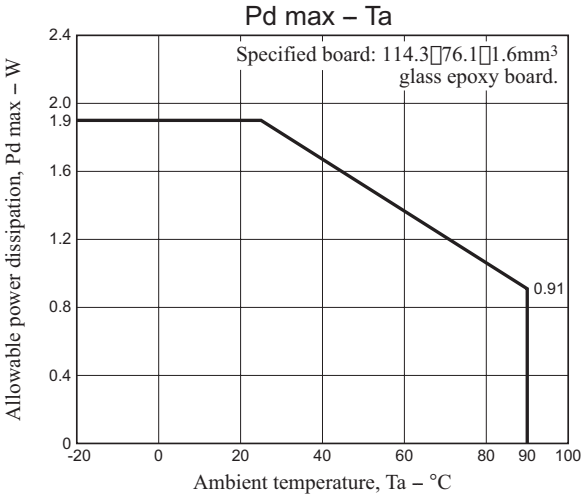
* Design guarantee value, Do not measurement.

Package Dimensions

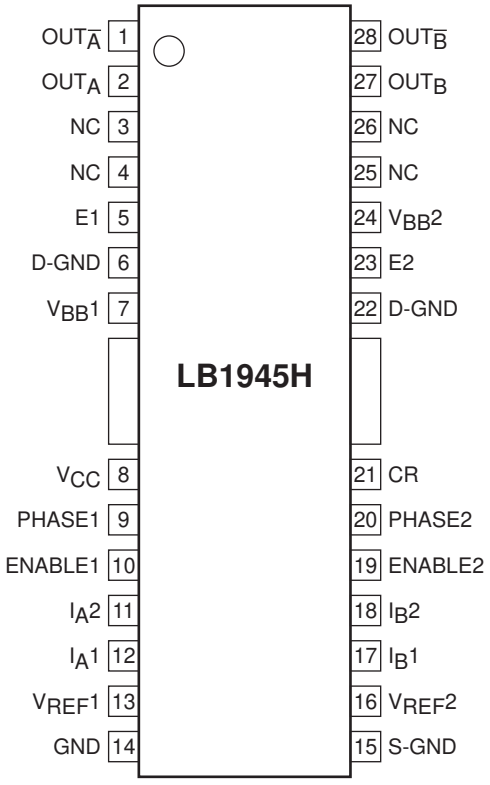
unit : mm (typ)

3233B

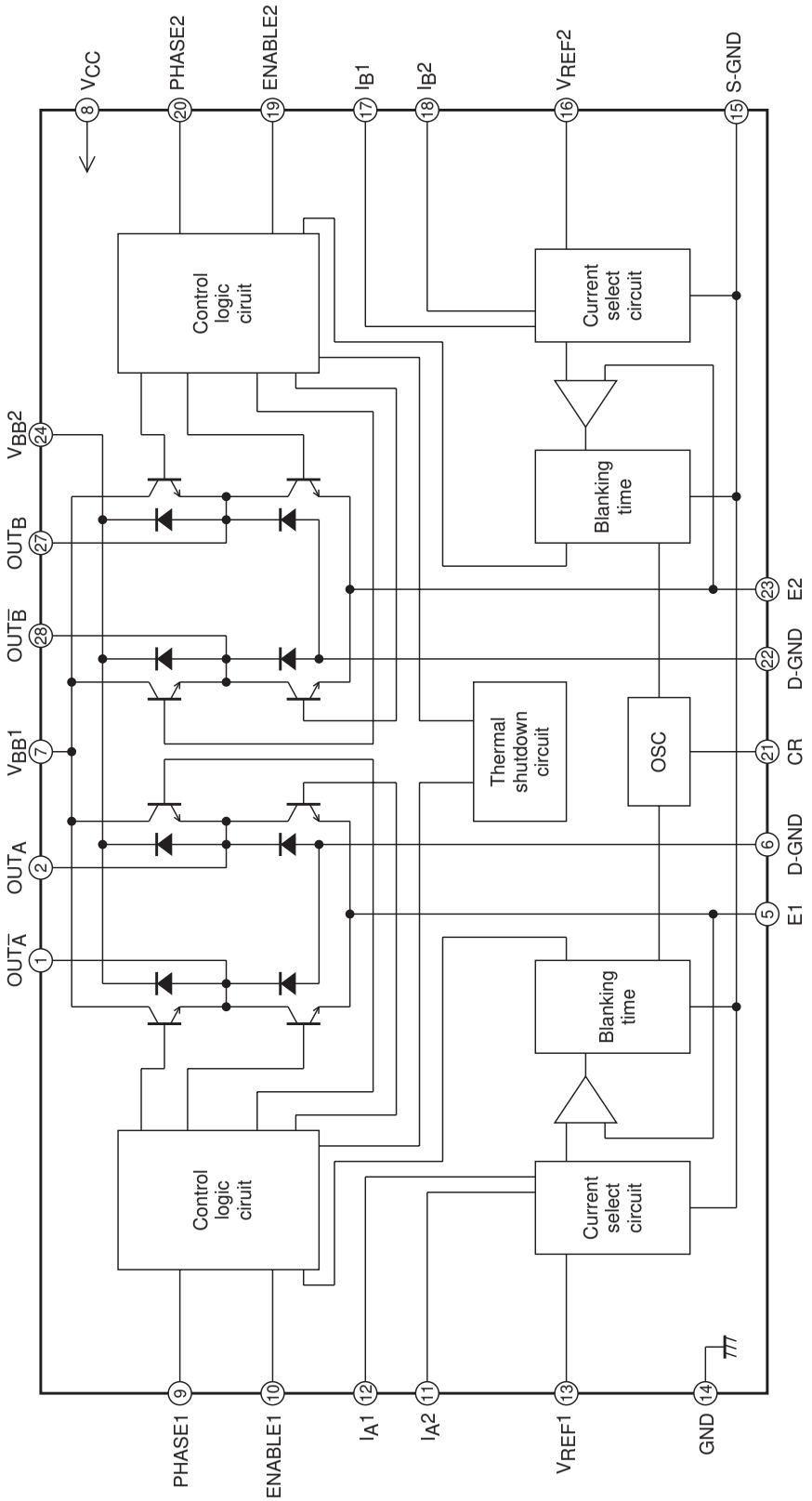




Pin Assignment



Block Diagram



Truth Table

ENABLE	PHASE	OUT_A	$OUT_{\overline{A}}$
L	H	H	L
L	L	L	H
H	–	OFF	OFF

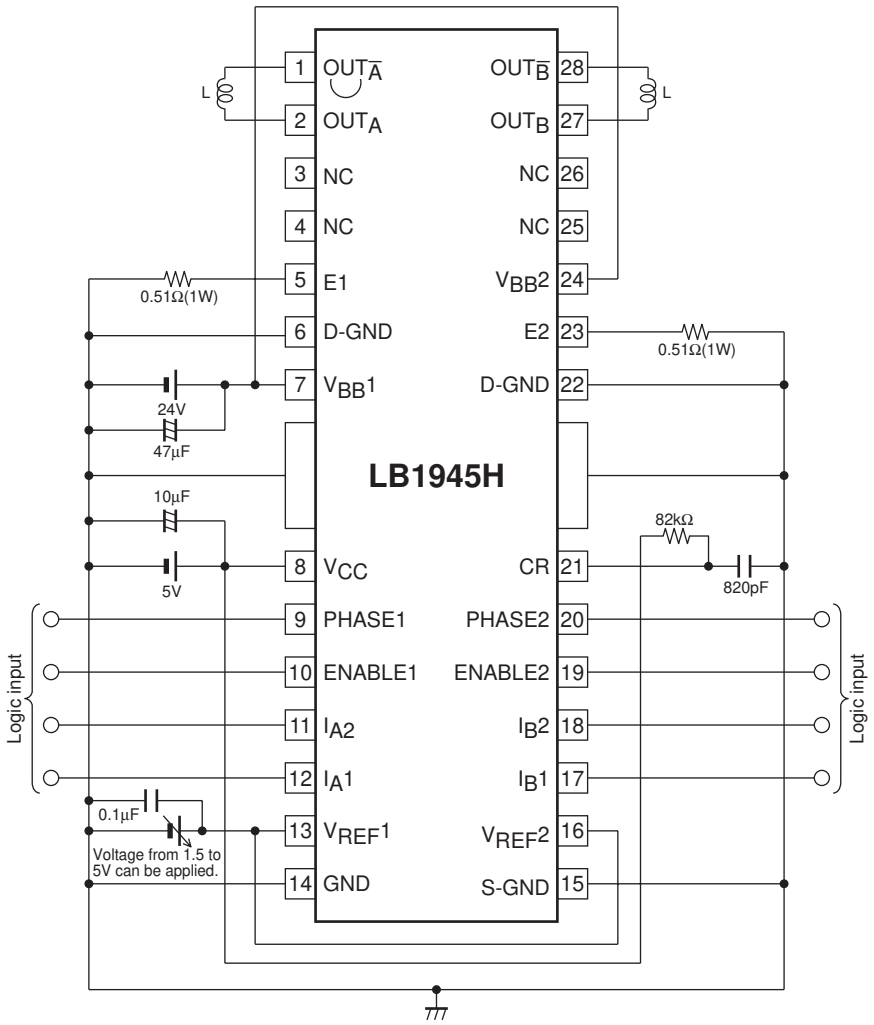
I_1	I_2	Output current
L	L	Vref / (10 × RE) = I_{OUT}
H	L	Vref / (15 × RE) = I_{OUT} × 2/3
L	H	Vref / (30 × RE) = I_{OUT} × 1/3
H	H	0

Note: Output is OFF when ENABLE = H or when I_1 = I_2 = H.

Pin Function

Pin No.	Pin name	Function
7	$V_{BB}1$	Output stage power supply voltage pin.
24	$V_{BB}2$	Cathode pin for the upper-side diodes.
5 23	E1 E2	Insert resistor RE between these pins and ground to control set current.
2 1 27 28	OUT_A $OUT_{\overline{A}}$ OUT_B $OUT_{\overline{B}}$	Output pins.
14	GND	Ground pin.
15	S-GND	Sense ground pin.
6 22	D-GND D-GND	Lower-side internal diode ground (anode).
21	CR	Triangular wave chopping with CR constant setting. Triangular wave OFF time is noise cancel time.
13 16	$V_{REF}1$ $V_{REF}2$	Output current setting pins. (Output current is set by inputting a 1.5V to 7.5V voltage.)
9 20	PHASE1 PHASE2	Output phase select input pin. High input: OUT_A = H, $OUT_{\overline{A}}$ = L Low input: OUT_A = L, $OUT_{\overline{A}}$ = H
10 19	ENABLE1 ENABLE2	Output ON/OFF setting input pins. High input: output OFF Low input: output ON
12,11 17,18	I_A1,I_A2 I_B1,I_B2	Output current setting digital input pins. Current is set to 1/3, 2/3, 1 by High and Low combinations.
8	V_{CC}	Logic block power supply voltage pin.

Application Circuit Example



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

Usage Notes

1. VREF pin
   Because the VREF 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 RE 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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