Ordering number : ENN*6193

Monolithic Digital IC

LB1945H

PWM Current Control Type Stepping Motor Driver

Preliminary

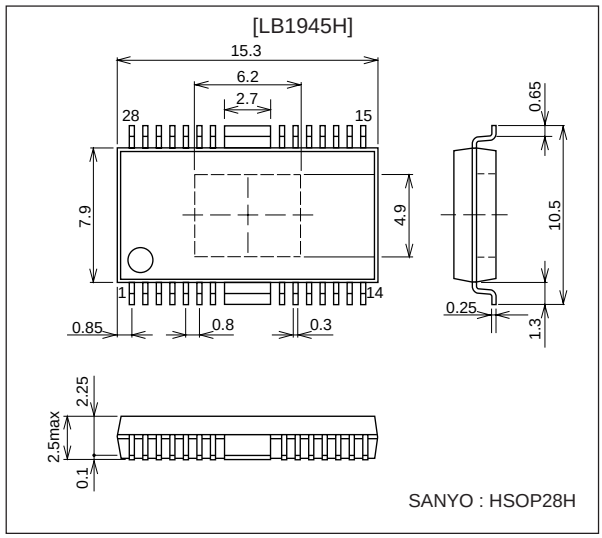
Features

- 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 VCC	V
Emitter output voltage	V_E max		1.0	V
Allowable power dissipation	Pd max	Ta = 25°C, with specified substrate*	1.9	W
Operating temperature	Topr		–20 to +90	°C
Storage temperature	Tstg		–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 Ta = 25°C, V_{BB} = 24V, V_{CC} = 5V, V_{REF} = 5.0V

	Parameter	Symbol	Conditions	Ratings min	Ratings typ	Ratings max	Unit
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 1	V osat 1	Io = +0.5A sink		0.3	0.5	V
	2	V osat 2	Io = +0.8A sink		0.5	0.7	V
	3	V osat 3	Io = –0.5A source		1.6	1.8	V
	4	V osat 4	Io = –0.8A source		1.8	2.0	V
	Output leakage current	I o1(leak)	V_O = V sink			50	µA
		I o2(leak)	V_O = 0V source	–50			µA
	Output sustain voltage	V_{SUS}	L = 3.9 mH Io = 1.0A *1	30			V
Logic Block	Logic supply current	$I_{CC\ ON}$	I_1 = 0.8V, I_2 = 0.8V, ENABLE = 0.8V	50.0	70.0	92.0	mA
		$I_{CC\ OFF}$	ENABLE = 3.2V	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} = 3.2V	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	I ref	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}			170		°C
	Temperature hysteresis width	ΔT_{TSD}			40		°C

*1: Assured design target value, not measured

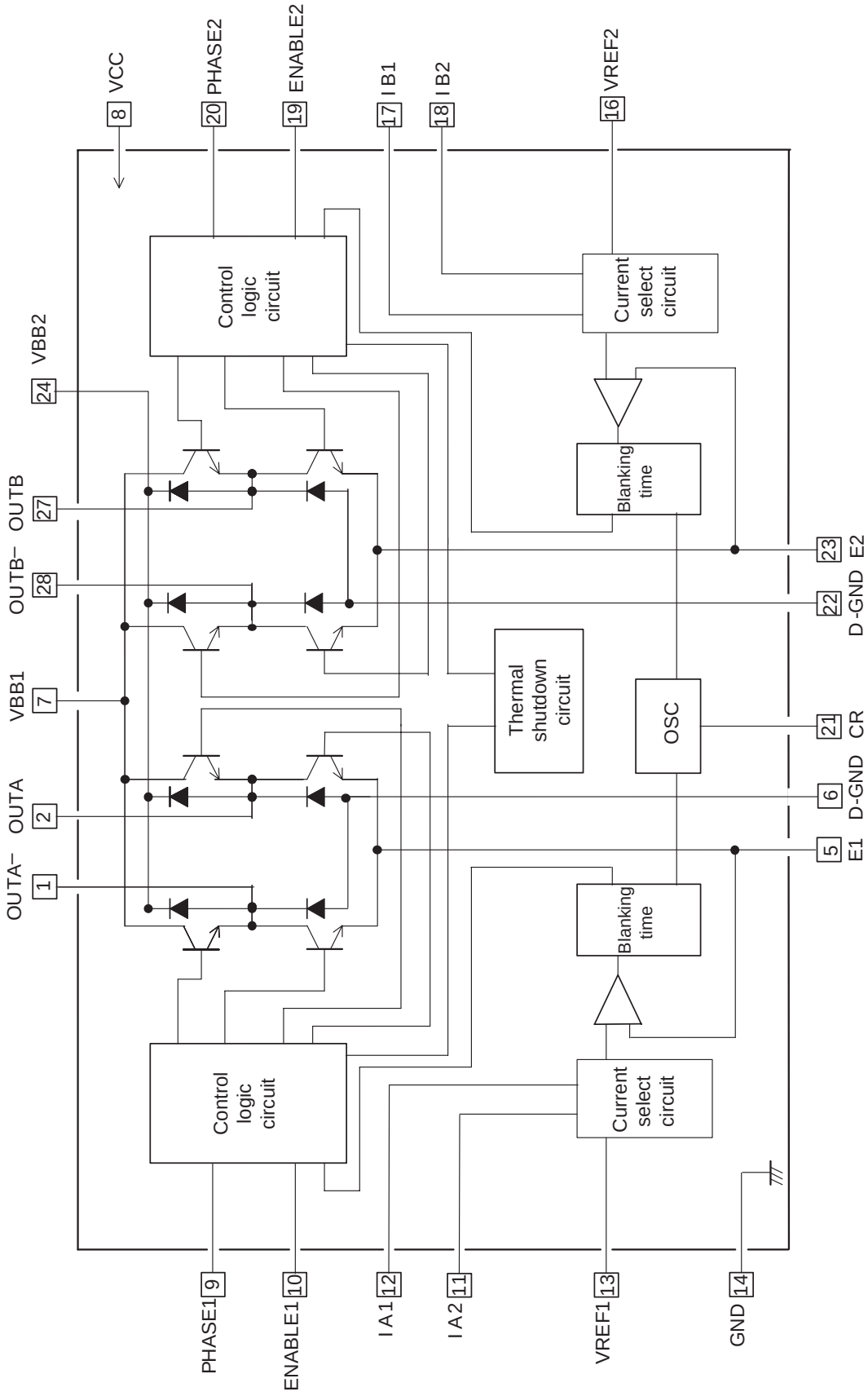
Truth Table

ENABLE	PHASE	OUTA	OUTA⁻
L	H	H	L
L	L	L	H
H	–	OFF	OFF

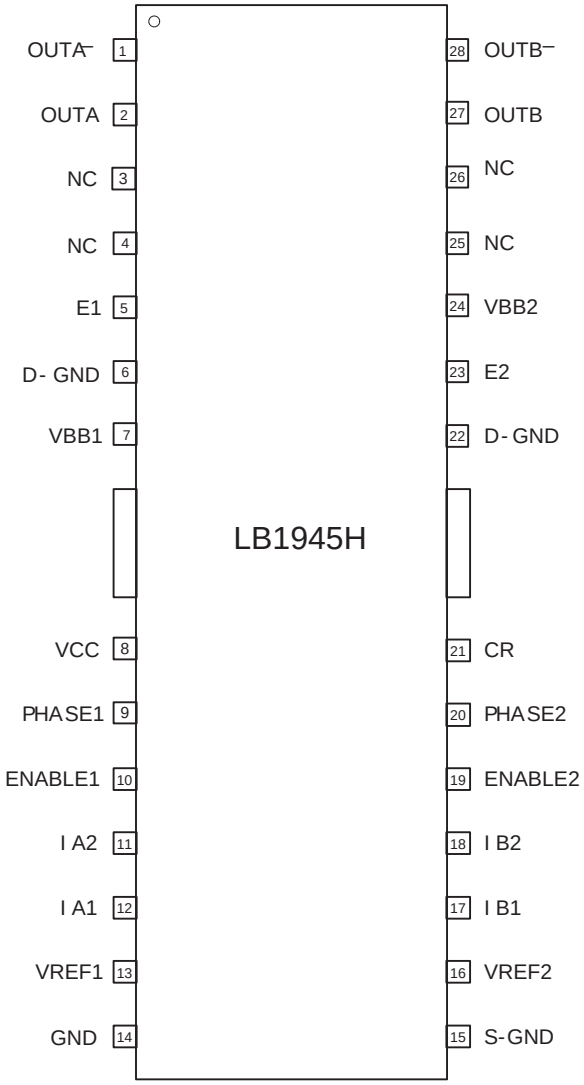
I1	I2	Output current
L	L	Vref / (10 × R_E) = I_{OUT}
H	L	Vref / (15 × R_E) = I_{OUT} × 2/3
L	H	Vref / (30 × R_E) = I_{OUT} × 1/3
H	H	0

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

Block Diagram

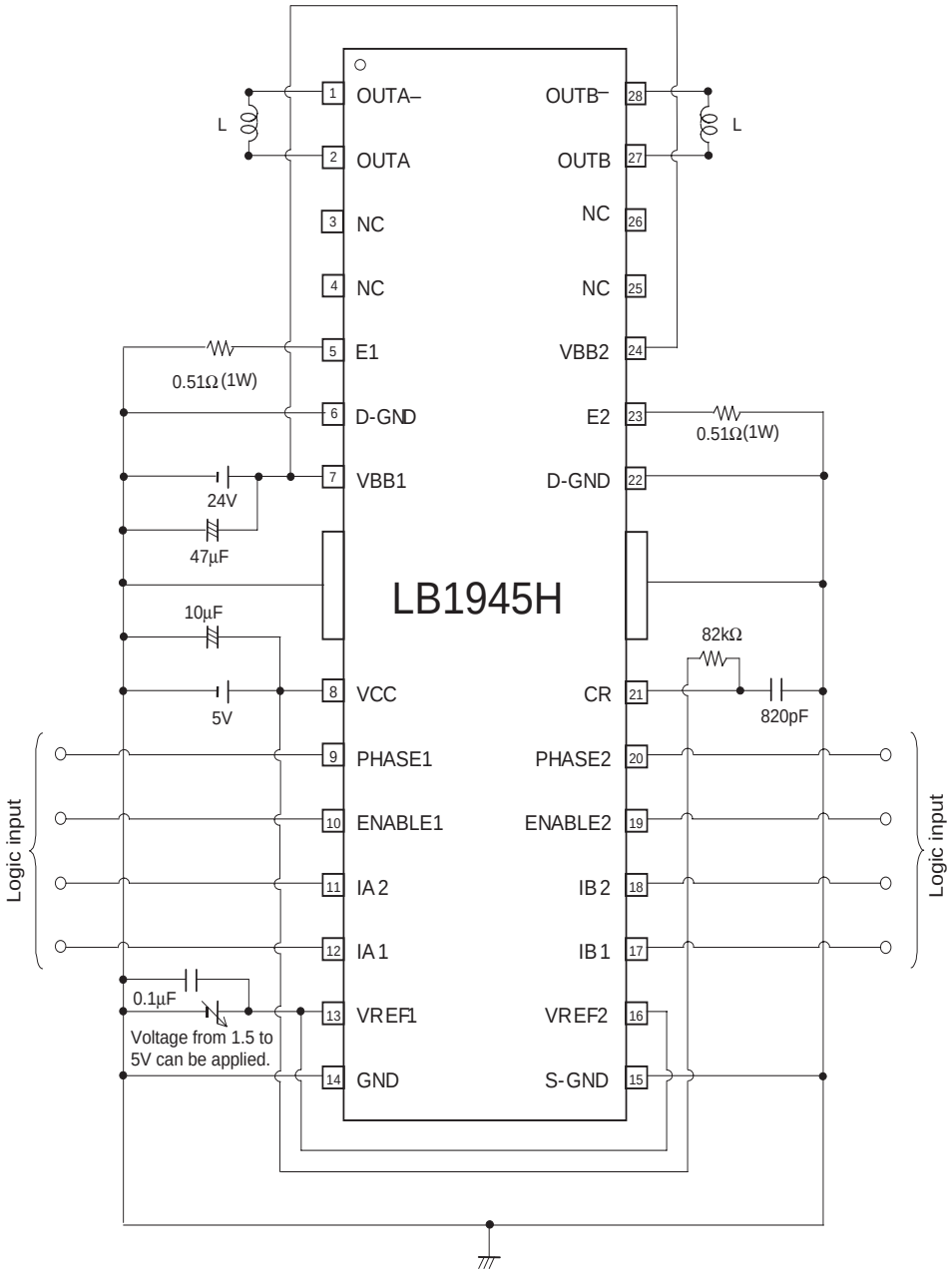


Pin Assignment



Top view

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
$V_{BB}1$	7	Output stage power supply voltage pin.
$V_{BB}2$	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.
$V_{REF}1$	13	Output current setting pins.
$V_{REF}2$	16	(Output current is set by inputting a 1.5V to 7.5V voltage.)
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.
ENABLE2	19	High input: output OFF
		Low input: output ON
I_{A1}, I_{A2}	12, 11	Output current setting digital input pins.
I_{B1}, I_{B2}	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}.