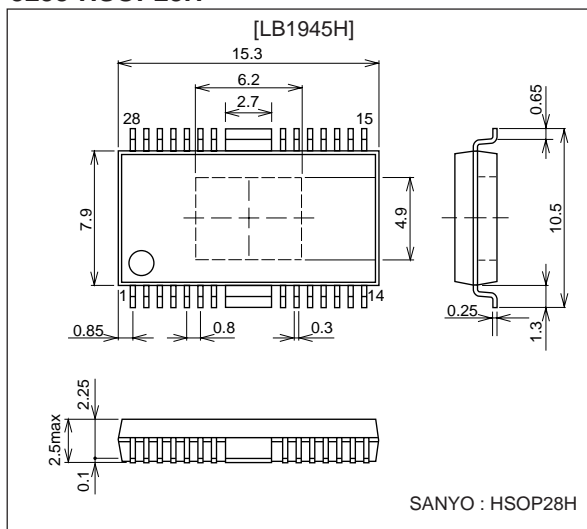


**LB1945H****PWM Current Control Type Stepping Motor Driver****Preliminary****Features**

- 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 <sub>BB</sub> max		30	V
Output peak current	I <sub>OPEAK</sub>	tw ≤ 20 μs	1.0	A
Output continuous current	I <sub>O</sub> max		0.8	A
Logic supply voltage	V <sub>CC</sub> max		6.0	V
Logic input voltage range	V <sub>IN</sub> max		–0.3 to V <sub>CC</sub>	V
Emitter output voltage	V <sub>E</sub> max		1.0	V
Allowable power dissipation	P <sub>d</sub> max	Ta = 25°C, with specified substrate*	1.9	W
Operating temperature	T <sub>opr</sub>		–20 to +90	°C
Storage temperature	T <sub>stg</sub>		–55 to +150	°C

\* Specified substrate: 114.3 × 76.1 × 1.6 mm<sup>3</sup>, glass epoxy**Allowable Operating Ranges at Ta = 25°C**

Parameter	Symbol	Conditions	Ratings	Unit
Motor supply voltage	V <sub>BB</sub>		10 to 28	V
Logic supply voltage	V <sub>CC</sub>		4.75 to 5.25	V
Reference voltage	V <sub>REF</sub>		1.5 to 5.0	V

■ Any and all SANYO products described or contained herein do not have specifications that can handle applications that require extremely high levels of reliability, such as life-support systems, aircraft's control systems, or other applications whose failure can be reasonably expected to result in serious physical and/or material damage. Consult with your SANYO representative nearest you before using any SANYO products described or contained herein in such applications.

■ SANYO assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all SANYO products described or contained herein.

**Electrical Characteristics at Ta = 25°C, VBB = 24V, VCC = 5V, VREF = 5.0V**

Parameter		Symbol	Conditions	Ratings			Unit
				min	typ	max	
Output Block	Output stage supply current	I <sub>BB ON</sub>	I <sub>1</sub> = 0.8V, I <sub>2</sub> = 0.8V, ENABLE = 0.8V	0.5	1.0	2.0	mA
		I <sub>BB OFF</sub>	ENABLE = 3.2V			0.2	mA
	Output saturation voltage 1 2 3 4	V <sub>osat 1</sub>	I <sub>o</sub> = +0.5A sink		0.3	0.5	V
		V <sub>osat 2</sub>	I <sub>o</sub> = +0.8A sink		0.5	0.7	V
		V <sub>osat 3</sub>	I <sub>o</sub> = -0.5A source		1.6	1.8	V
		V <sub>osat 4</sub>	I <sub>o</sub> = -0.8A source		1.8	2.0	V
	Output leakage current	I <sub>o1(leak)</sub>	V <sub>o</sub> = V sink			50	μA
		I <sub>o2(leak)</sub>	V <sub>o</sub> = 0V source	-50			μA
Logic Block	Logic supply current	I <sub>CC ON</sub>	I <sub>1</sub> = 0.8V, I <sub>2</sub> = 0.8V, ENABLE = 0.8V	50.0	70.0	92.0	mA
		I <sub>CC OFF</sub>	ENABLE = 3.2V	7.0	10.0	13.0	mA
	Input voltage	V <sub>IH</sub>		3.2			V
		V <sub>IL</sub>				0.8	V
	Input current	I <sub>IH</sub>	V <sub>IH</sub> = 3.2V	35	50	65	μA
		I <sub>IL</sub>	V <sub>IL</sub> = 0.8V	7	10	13	μA
	Set current control threshold value	V <sub>ref</sub> /V <sub>sen</sub>	I <sub>1</sub> = 0.8V, I <sub>2</sub> = 0.8V	9.5	10	10.5	
			I <sub>1</sub> = 3.2V, I <sub>2</sub> = 0.8V	13.5	15	16.5	
			I <sub>1</sub> = 0.8V, I <sub>2</sub> = 3.2V	25.5	30	34.5	
	Reference current	I <sub>ref</sub>	V <sub>ref</sub> = 5.0V, I <sub>1</sub> = 0.8V, I <sub>2</sub> = 0.8V	17.5	25	32.5	μA
	CR pin current	I <sub>CR</sub>	CR = 1.0V	-1.0			mA
	Thermal shutdown temperature	T <sub>TSD</sub>			170		°C
	Temperature hysteresis width	ΔT <sub>TSD</sub>			40		°C

\*1: Assured design target value, not measured

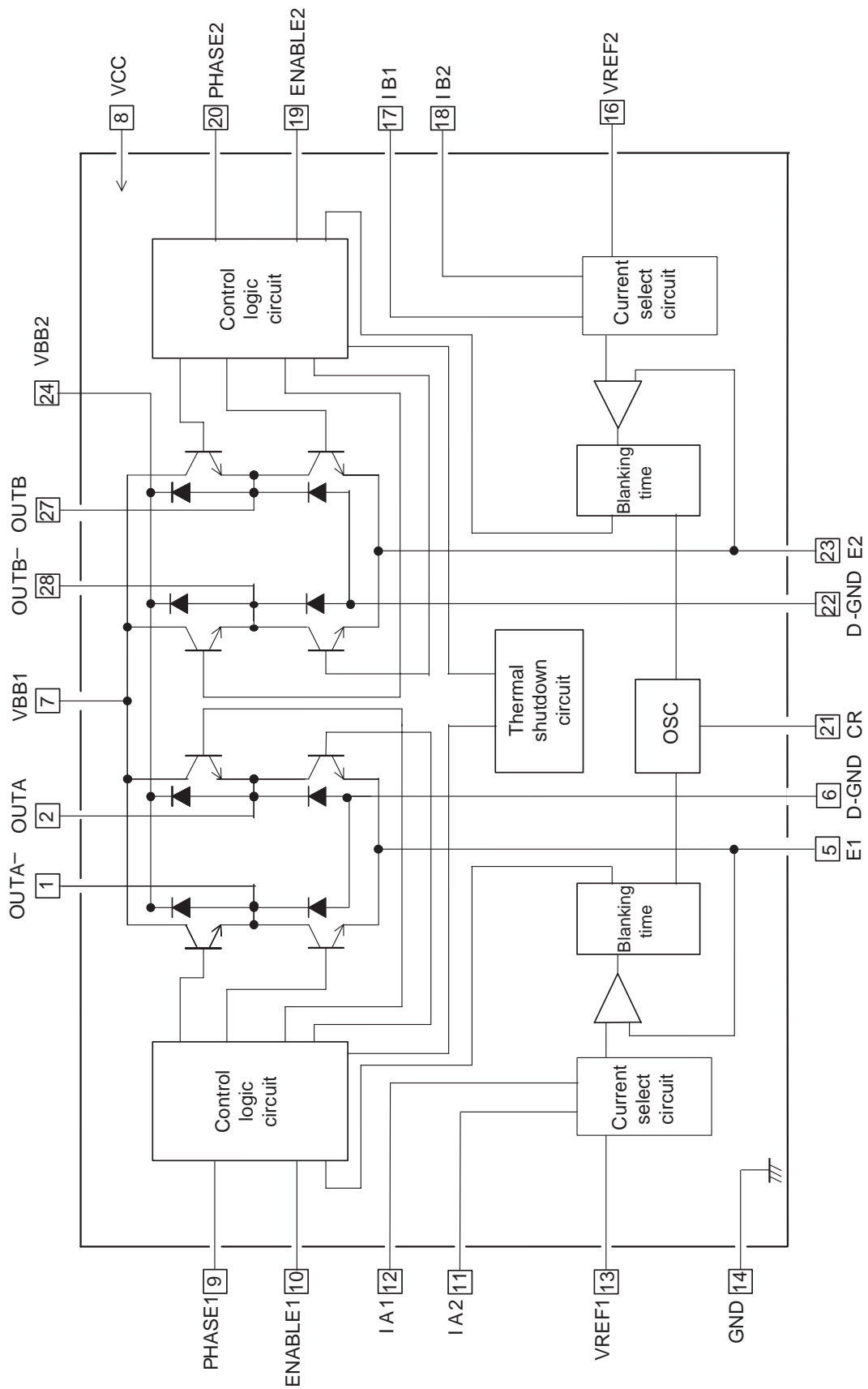
**Truth Table**

ENABLE	PHASE	OUTA	OUTA <sup>-</sup>
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

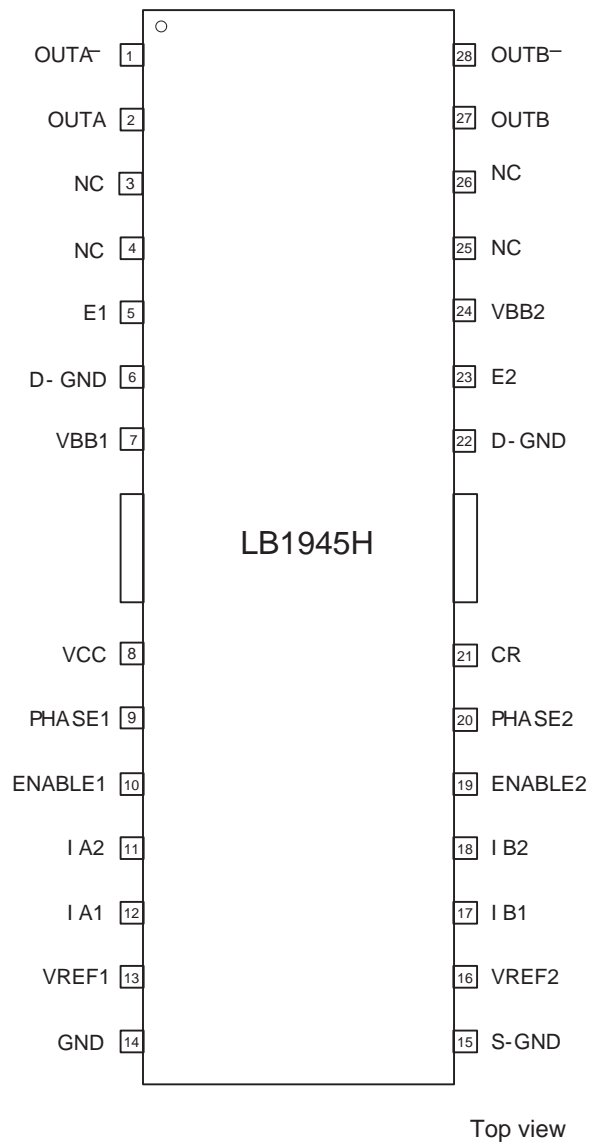
Note: Output is OFF when ENABLE = H or when I1 = I2 = H.

Block Diagram

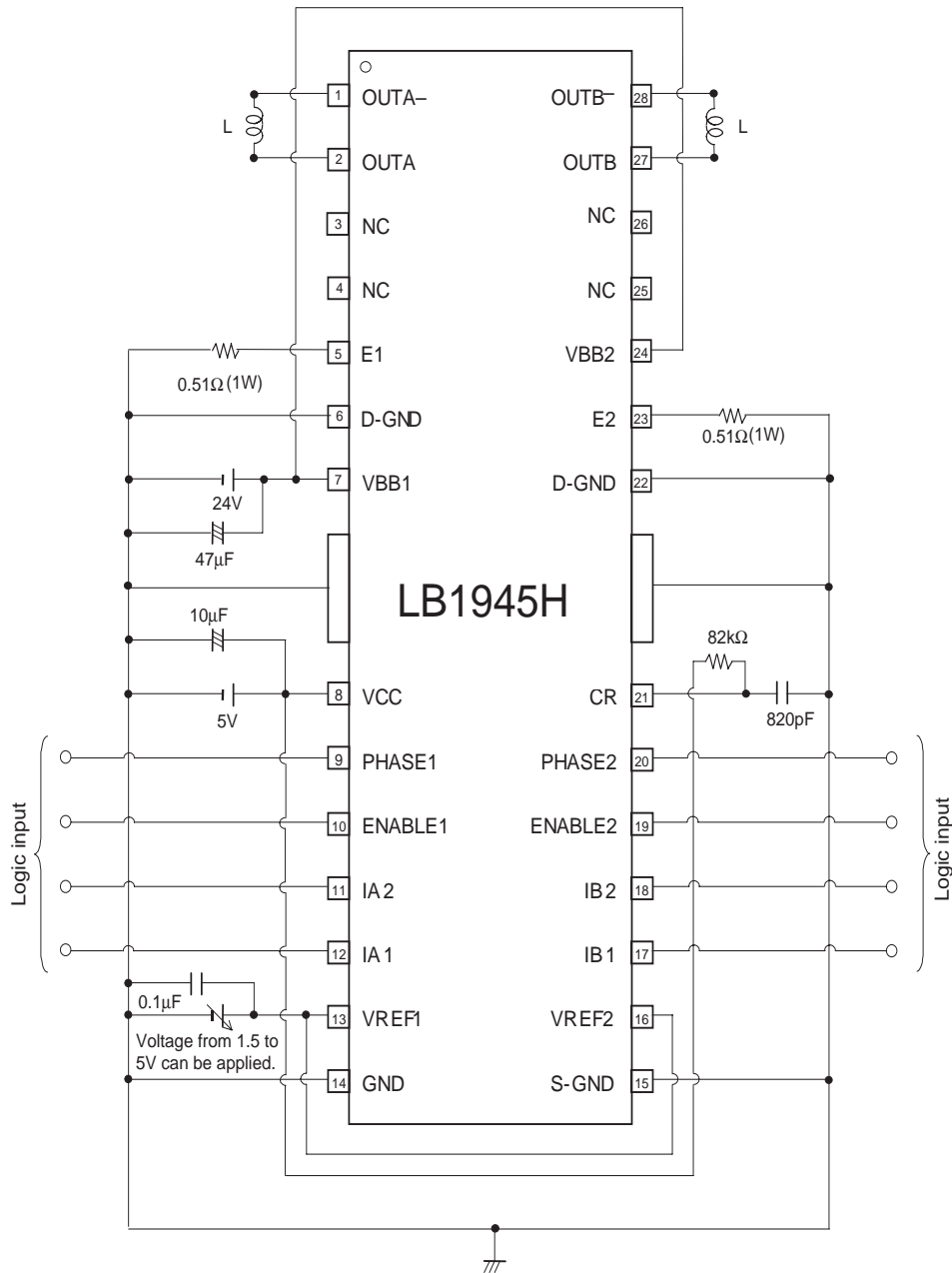


# LB1945H

## Pin Assignment



## 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 <sub>BB1</sub>	7	Output stage power supply voltage pin.
V <sub>BB2</sub>	24	Cathode pin for the upper-side diodes.
E1	5	Insert resistor R <sub>E</sub> between these pins and ground to control set current.
E2	23	
OUTA	2	Output pins.
OUTA <sup>-</sup>	1	
OUTB	27	
OUTB <sup>-</sup>	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 <sub>REF1</sub>	13	Output current setting pins. (Output current is set by inputting a 1.5V to 7.5V voltage.)
V <sub>REF2</sub>	16	
PHASE1	9	Output phase select input pin. High input: OUTA = H, OUTA <sup>-</sup> = L Low input: OUTA = L, OUTA <sup>-</sup> = H
PHASE2	20	
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. Current is set to 1/3, 2/3, 1 by High and Low combinations.
IB1, IB2	17, 18	
V <sub>CC</sub>	8	Logic block power supply voltage pin.

**Usage Notes****1. V<sub>REF</sub> pin**

Because the V<sub>REF</sub> 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<sub>E</sub> at pin E should be located close to the IC ground. Pattern layout should be designed so that the capacitors between V<sub>CC</sub> and ground and V<sub>BB</sub> and ground are close to V<sub>CC</sub> and V<sub>BB</sub>.

- Specifications of any and all SANYO products described or contained herein stipulate the performance, characteristics, and functions of the described products in the independent state, and are not guarantees of the performance, characteristics, and functions of the described products as mounted in the customer's products or equipment. To verify symptoms and states that cannot be evaluated in an independent device, the customer should always evaluate and test devices mounted in the customer's products or equipment.
- SANYO Electric Co., Ltd. strives to supply high-quality high-reliability products. However, any and all semiconductor products fail with some probability. It is possible that these probabilistic failures could give rise to accidents or events that could endanger human lives, that could give rise to smoke or fire, or that could cause damage to other property. When designing equipment, adopt safety measures so that these kinds of accidents or events cannot occur. Such measures include but are not limited to protective circuits and error prevention circuits for safe design, redundant design, and structural design.
- In the event that any or all SANYO products(including technical data, services) described or contained herein are controlled under any of applicable local export control laws and regulations, such products must not be exported without obtaining the export license from the authorities concerned in accordance with the above law.
- No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying and recording, or any information storage or retrieval system, or otherwise, without the prior written permission of SANYO Electric Co., Ltd.
- Any and all information described or contained herein are subject to change without notice due to product/technology improvement, etc. When designing equipment, refer to the "Delivery Specification" for the SANYO product that you intend to use.
- Information (including circuit diagrams and circuit parameters) herein is for example only ; it is not guaranteed for volume production. SANYO believes information herein is accurate and reliable, but no guarantees are made or implied regarding its use or any infringements of intellectual property rights or other rights of third parties.

This catalog provides information as of August, 1999. Specifications and information herein are subject to change without notice.