



LB1846M, 1848M

Low-Voltage/Low Saturation Voltage Type Bidirectional Motor Driver

An ON Semiconductor Company

Overview

The LB1846M and LB1848M are 2-channel low-voltage, low saturation voltage type bidirectional motor driver ICs that are optimal for use as 2-phase stepping motor drivers in printers, floppy disk drives, and cameras and other portable equipment. The output circuits are of the bipolar type, with pnp transistors in the upper side and npn transistors in the lower side, and they achieve low saturation output and low power characteristics despite being provided in a miniature package.

Both of these IC products can directly control a motor from signals from a microcontroller. The LB1846M is optimal for 1-2 phase excitation drive for 2-phase stepping motors using 4-input logic (IN1, IN2, IN3, and IN4) and the LB1848M is optimal for 2-phase excitation drive for 2-phase stepping motors using 3-input logic (ENA, IN1, and IN2).

Another point is that these ICs include built-in thermal shutdown circuits so that IC scorching or burning is prevented in advance even if the IC outputs are shorted. Additionally, the MFP-10S miniature package used supports reduced-space mounting.

Features

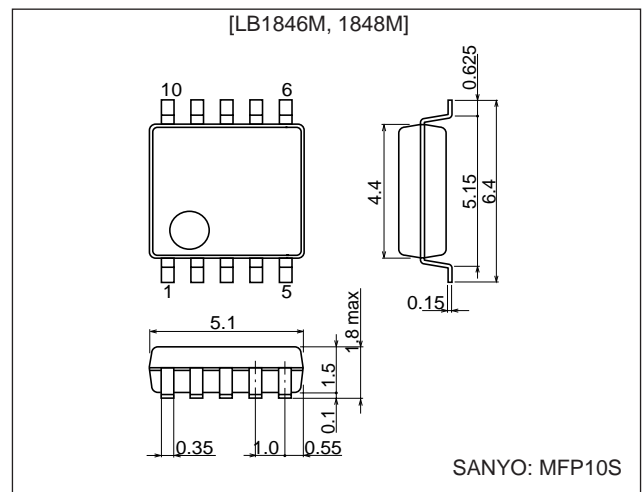
- Optimal for 1-2 phase excitation drive for 2-phase stepping motors (LB1846M)
- Optimal for 2 phase excitation drive for 2-phase stepping motors (LB1848M)
- Low saturation voltage. $V_{O(sat)} = 0.55$ V typical at $I_O = 400$ mA

- Standby current: zero
- Thermal shutdown circuit
- Miniature package: MFP-10S (6.5×5.1 mm²)
- Through-current prevention circuit (LB1848M only)
- “Soft off” function that reduces power supply line noise when switching from drive to standby modes. (Requires the use of one external capacitor.) (LB1848M only)
- No limitations on the magnitude relationship between the power supply voltage (V_{CC}) and the input voltage (V_{IN})

Package Dimensions

unit: mm

3086A-MFP10S



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LB1846M, 1848M

Specifications

Absolute Maximum Ratings at $T_a = 25^\circ\text{C}$

| Parameter | Symbol | Conditions | Ratings | Unit |
|-----------------------------|---------------------|----------------|-------------------|------------------|
| Maximum supply voltage | $V_{CC\text{ max}}$ | | -0.3 to +8.0 | V |
| Output voltage | V_{OUT} | | $V_{CC} + V_{SF}$ | V |
| Input voltage | V_{IN} | | -0.3 to +8.0 | V |
| Ground pin outflow current | I_{GND} | Per channel | 800 | mA |
| Allowable power dissipation | $Pd\text{ max1}$ | Independent IC | 350 | mW |
| | $Pd\text{ max2}$ | When mounted* | 870 | mW |
| Operating temperature | T_{opr} | | -20 to +75 | $^\circ\text{C}$ |
| Storage temperature | T_{stg} | | -40 to +150 | $^\circ\text{C}$ |

Note: *On the specified circuit board (a $114.3 \times 76.2 \times 1.5\text{-mm}^3$ glass-epoxy printed circuit board)

Allowable Operating Ranges at $T_a = 25^\circ\text{C}$

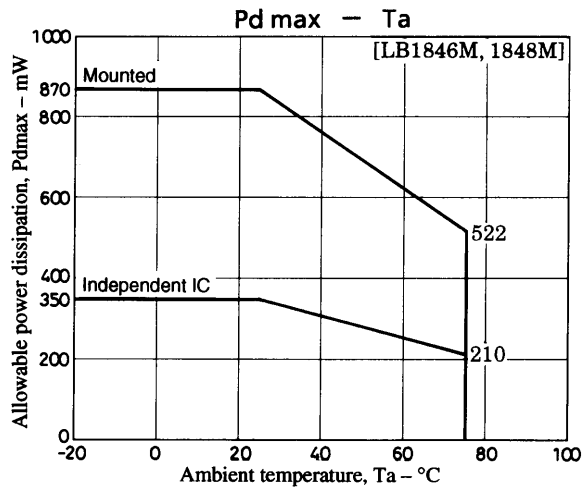
| Parameter | Symbol | Conditions | Ratings | Unit |
|--------------------------|----------|------------|--------------|------|
| Supply voltage | V_{CC} | | 2.5 to 7.5 | V |
| Input high-level voltage | V_{IH} | | 2.0 to 7.5 | V |
| Input low-level voltage | V_{IL} | | -0.3 to +0.7 | V |

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

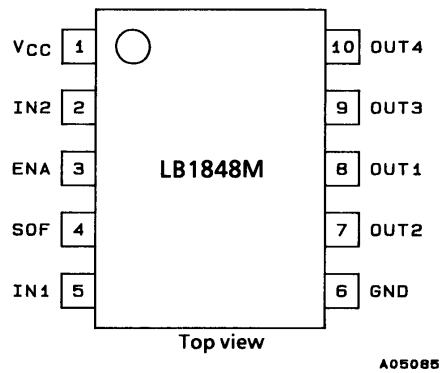
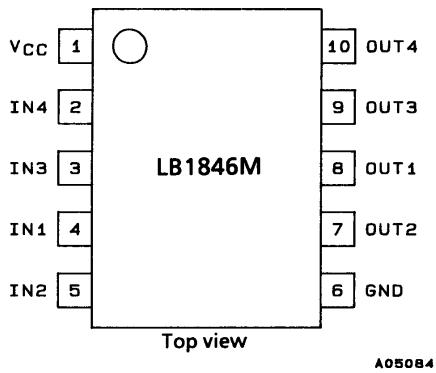
| Parameter | Symbol | Conditions | Ratings | | | Unit |
|---------------------------|--------------------|---|---------|------|-----|---------------|
| | | | min | typ | max | |
| [LB1846M] | | | | | | |
| Current drain | I_{CC0} | IN1, 2, 3, 4 = 0 V | | 0.1 | 10 | μA |
| | I_{CC1} | IN1, 3 = 3 V, IN2, 4 = 0 V | | 30 | 40 | mA |
| Output saturation voltage | V_{OUT1} | $V_{IN} = 3\text{ V or }0\text{ V}$, $V_{CC} = 3\text{ to }7.5\text{ V}$, $I_{OUT} = 200\text{ mA}$ | | 0.27 | 0.4 | V |
| | V_{OUT2} | $V_{IN} = 3\text{ V or }0\text{ V}$, $V_{CC} = 4\text{ to }7.5\text{ V}$, $I_{OUT} = 400\text{ mA}$ | | 0.55 | 0.8 | V |
| Input current | I_{IN} | $V_{IN} = 5\text{ V}$ | | 150 | 200 | μA |
| [Spark Killer Diode] | | | | | | |
| Reverse current | $I_S(\text{leak})$ | | | | 30 | μA |
| Forward voltage | V_{SF} | $I_{OUT} = 400\text{ mA}$ | | | 1.7 | V |
| [LB1848M] | | | | | | |
| Current drain | I_{CC0} | ENA = 0 V, $V_{IN} = 3\text{ V or }0\text{ V}$ | | 0.1 | 10 | μA |
| | I_{CC1} | ENA = 3 V, $V_{IN} = 3\text{ V or }0\text{ V}$ | | 25 | 35 | mA |
| Output saturation voltage | V_{OUT1} | ENA = 3 V, $V_{IN} = 3\text{ V or }0\text{ V}$, $V_{CC} = 3\text{ to }7.5\text{ V}$, $I_{OUT} = 200\text{ mA}$ | | 0.27 | 0.4 | V |
| | V_{OUT2} | ENA = 3 V, $V_{IN} = 3\text{ V or }0\text{ V}$, $V_{CC} = 4\text{ to }7.5\text{ V}$, $I_{OUT} = 400\text{ mA}$ | | 0.55 | 0.8 | V |
| Input current 1 | I_{IN} | $V_{IN} = 5\text{ V}$ | | 75 | 100 | μA |
| Input current 2 | I_{ENA} | ENA = 5 V | | 85 | 110 | μA |
| [Spark Killer Diode] | | | | | | |
| Reverse current | $I_S(\text{leak})$ | | | | 30 | μA |
| Forward voltage | V_{SF} | $I_{OUT} = 400\text{ mA}$ | | | 1.7 | V |

Note: The thermal shutdown circuit function values are design guarantees, and are not tested.

LB1846M, 1848M

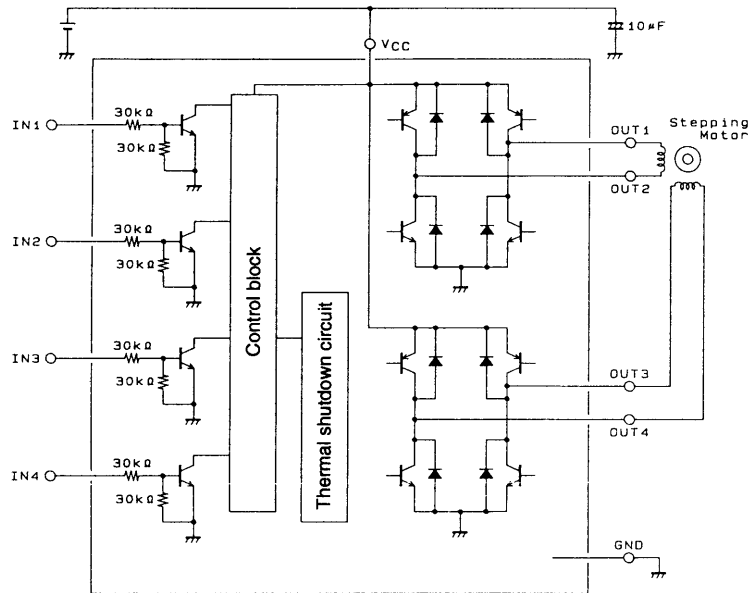


Pin Assignments



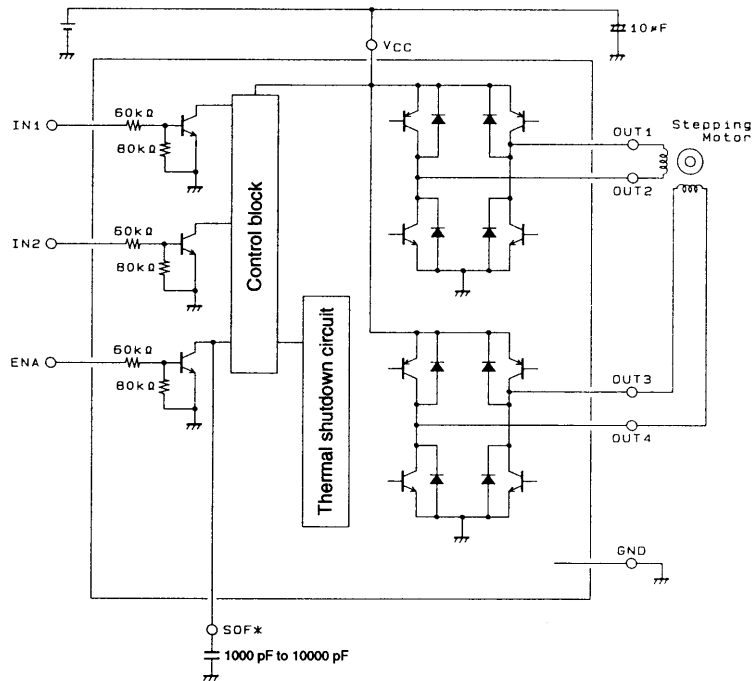
Block Diagrams

[LB1846M]



A05086

[LB1848M]



A05087

Note: When the "soft off" function is used, a capacitor must be connected to the SOF pin. If this function is not used, this pin must be left open with absolutely no signals or lines connected.

Notes on Wiring and Lines

Since large currents flow in the V_{CC} and ground lines, oscillations may occur on these lines. The following points should be observed if such oscillations occur.

- (1) Lower the line impedances by making them shorter and thicker.
- (2) Attach capacitors close to the IC.
- (3) If the controller (CPU) is mounted on a separate printed circuit board, insert series resistors (of about 10 kΩ) between the controller outputs and this IC.

LB1846M, 1848M

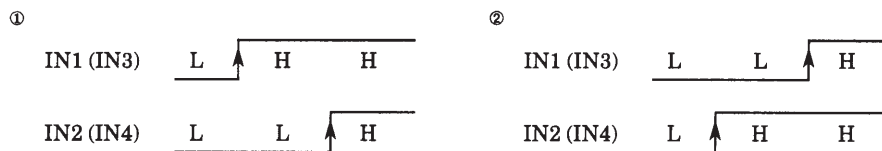
Truth Tables

[LB1846M]

| IN1 | IN2 | IN3 | IN4 | OUT1 | OUT2 | OUT3 | OUT4 | Notes |
|-----|-----|-----|-----|---|------|------|------|----------------------|
| L | L | L | L | OFF | OFF | OFF | OFF | Standby |
| H | L | L | L | H | L | OFF | OFF | 1-2 phase excitation |
| H | L | H | L | H | L | H | L | |
| L | L | H | L | OFF | OFF | H | L | |
| L | H | H | L | L | H | H | L | |
| L | H | L | L | L | H | OFF | OFF | |
| L | H | L | H | L | H | L | H | |
| L | L | L | H | OFF | OFF | L | H | |
| H | L | L | H | H | L | L | H | |
| H | H | — | — | The logic output for the first high-level input is produced. *2 | | | | |
| — | — | H | H | | | | | |

Note: 1. "—" indicates a "don't care" input.

2. If two high levels (H/H) are input to the IN1/IN2 pins with the timing shown in ① in the figure below, then the IN2 input that arrived later will be ignored and the IC will function as though an H/L combination is applied to the IN1/IN2 pins. Similarly, the timing shown in ② results in a L/H combination on the IN1/IN2 pins.



[LB1848M]

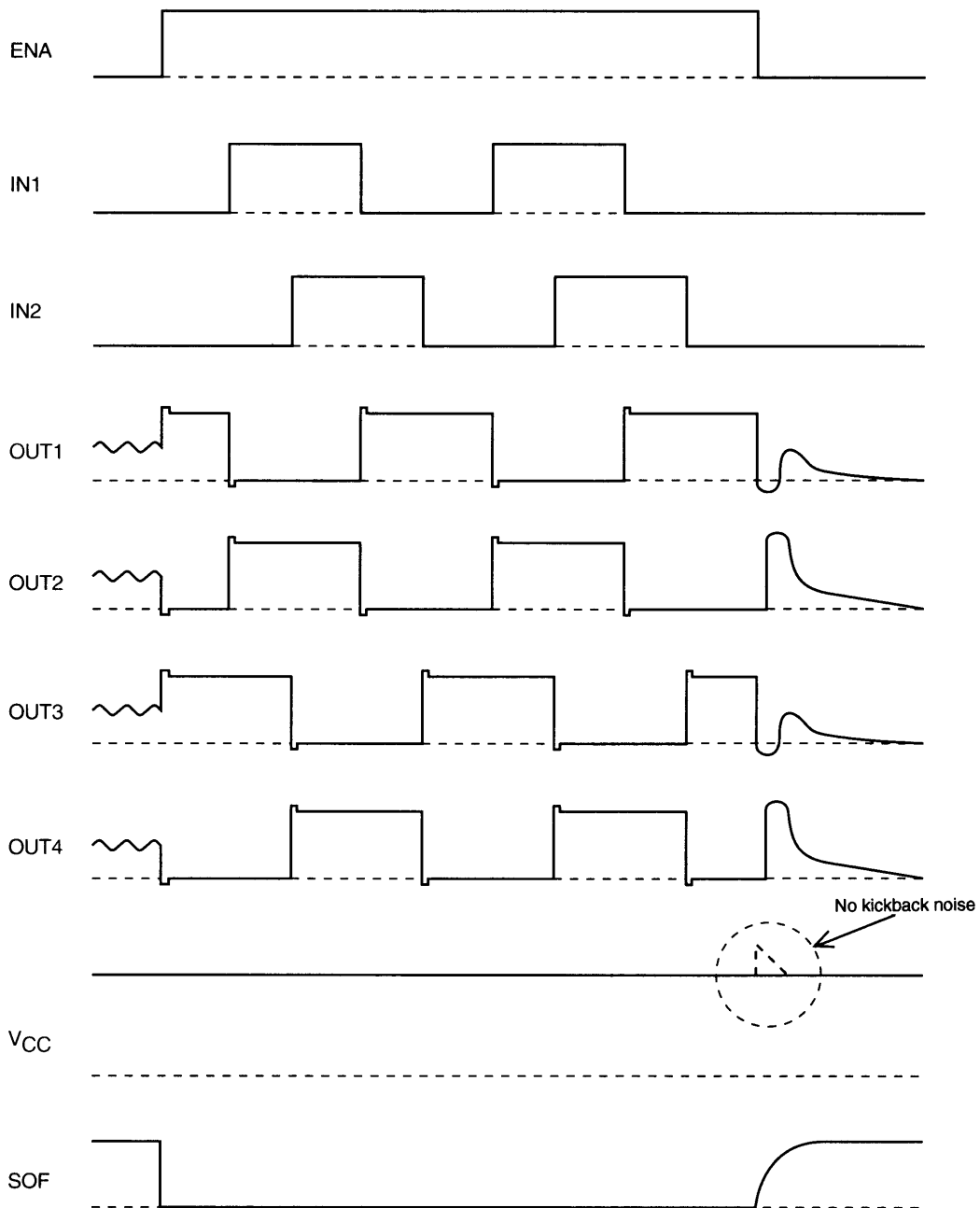
| ENA | IN1 | IN2 | OUT1 | OUT2 | OUT3 | OUT4 | Notes |
|-----|-----|-----|------|------|------|------|--------------------|
| L | — | — | OFF | OFF | OFF | OFF | Standby |
| H | L | L | H | L | H | L | 2-phase excitation |
| | L | H | H | L | L | H | |
| | H | H | L | H | L | H | |
| | H | L | L | H | H | L | |

Note: "—" indicates a "don't care" input.

SOF Pin (“Soft Off” Function) Operation [LB1848M only]

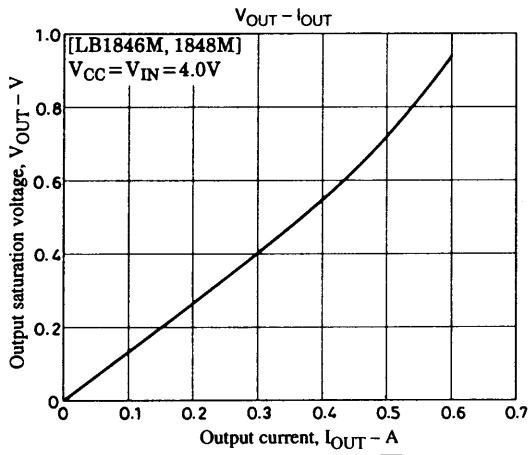
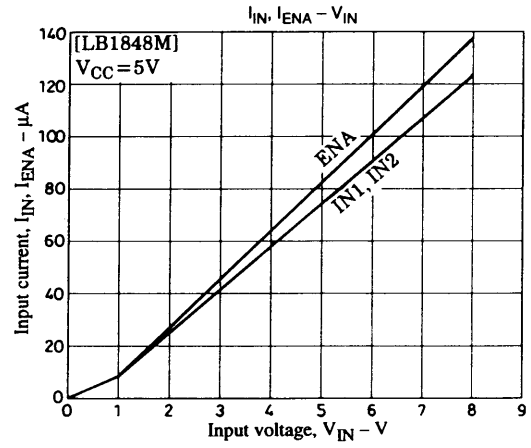
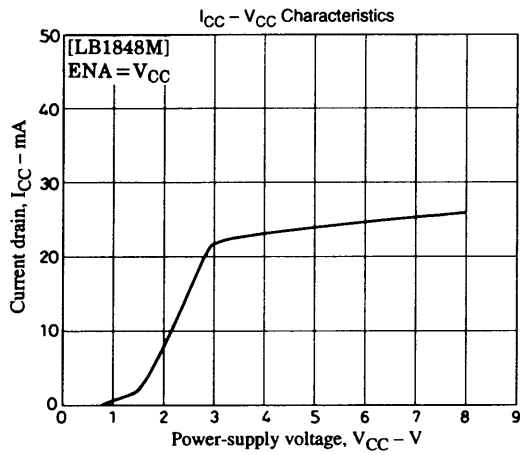
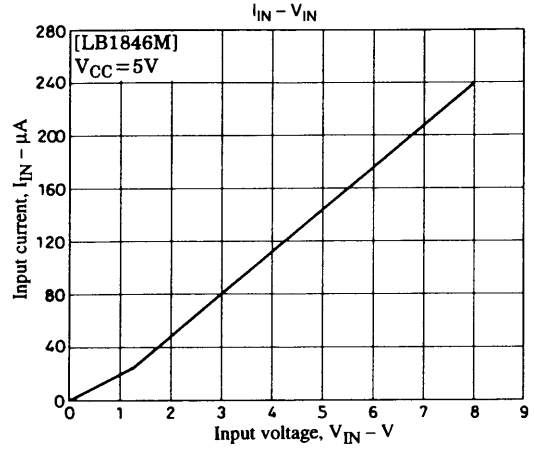
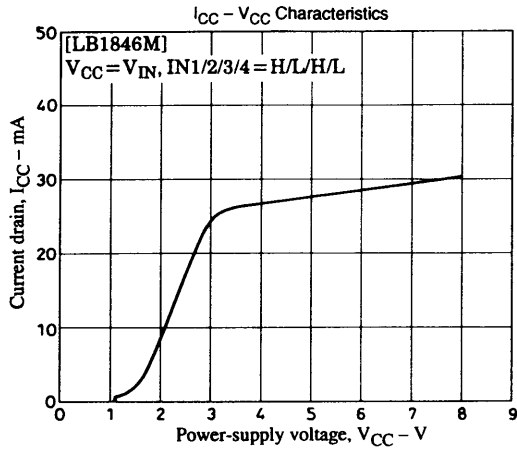
The soft off function reduces power supply line noise due to the kickback current generated when the stepping motor drive mode is switched from drive to standby. The “soft off” function provided by this IC operates when a capacitor (0.001 to 0.01 μF) is connected between the SOF pin and ground. (Leave the SOF pin open to disable the soft off function.)

The waveforms for each pin are shown below.



Timing Chart for Stepping Motor 2-Phase Excitation

LB1846M, 1848M



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