



Forward/Reverse Motor Driver with Braking Function

Overview

The LB1943 is a forward/reverse motor driver IC. This IC supports forward, reverse, and braking control from a single input, and the desired output voltage can be set with a resistor. Either full drive or VC drive can be selected from the single input, and the LB1943 can be controlled from a microprocessor.

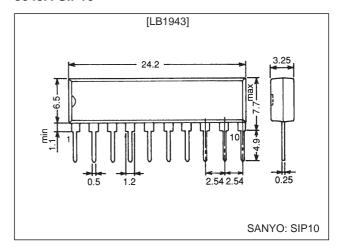
Functions

- Single-input control of forward, reverse, and braking operations
- Resistor output voltage setup
- Either full drive or VC drive can be selected from the single control input.
- Can be controlled from a microprocessor.
- Built-in motor dash current absorbing device
- Built-in reference voltage circuit
- · Built-in thermal protection circuit

Package Dimensions

unit: mm

3043A-SIP10



Specifications

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

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V _{CC} max		18	V
Input voltage	V _{IN}	V _{CC} ≥ V _{IN}	-0.3 to +6	V
Output current	I _{OUT}		±1.6	А
Allowable power dissipation	Pd max		1.2	W
Operating temperature	Topr		-25 to +75	°C
Storage temperature	Tstg		-55 to +125	°C

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

Parameter	Symbol	Conditions	Ratings	Unit	
Supply voltage range	V _{CC} 1		8 to 18	V	
Supply voltage range	V _{CC} 2	V _{CC} 1 ≥ V _{CC} 2	5 to 18	V	
Forward-reverse disabled time	Toff		Over 20	μs	

Electrical Characteristics at $Ta = 25^{\circ}C$, $V_{CC} = 12 \text{ V}$

Parameter	Symbol	Conditions	Ratings			Unit
	Symbol		min	typ	max	Offic
Input low-level voltage	V _{INL}		0		1	V
Input high-level voltage	V _{INH}		4.2		6.0	V
Input mid-level voltage	V _{INM}		2		3	V
Input impedance	Z _{IN}			75		kΩ
Current drain	I _{CC}			5.5	10.0	mA

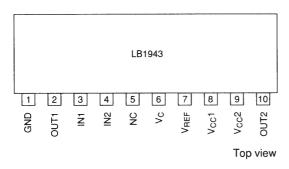
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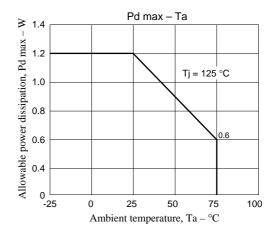
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Doromator	Cymphal	Conditions	Ratings			Unit	
Parameter	Symbol	Conditions	min	typ	max	l Ollic	
Output valtage	V _{OUT} 1	$R_L = 60 \Omega$, $V_C = 2.5 V$ $V_{IN}1 = 2.5 V$, $V_{IN}2 = 0 V$	4.4	4.95	5.4	V	
Output voltage	V _{OUT} 2	$R_L = 60 \Omega$, $V_C = 2.5 V$ $V_{IN}1 = 2.5 V$, $V_{IN}2 = 5.0 V$	4.4	4.95	5.4	V	
Output leakage current	I _{OL}	R _L = ∞		0.01	1.0	mA	
0	V (sat)11	V _{CC} = 12V, I _{OUT} = 300 mA		1.9	2.2	V	
Saturation voltage (upper)	V (sat)12	V _{CC} = 12V, I _{OUT} = 500 mA		1.9	2.3	V	
Saturation valtage (lawer)	V (sat)21	V _{CC} = 12V, I _{OUT} = 300 mA		0.25	0.5	V	
Saturation voltage (lower)	V (sat)22	V _{CC} = 12V, I _{OUT} = 500 mA		0.4	0.65	V	
Reference power supply	V _{REF}		6.0	6.35	6.8	V	
Reference voltage load characteristics	$\Delta V_{REF}/\Delta I_{REF}$	I _{REF} = 0 to -2.0 mA		0.05	0.1	V/mA	
Control-to-output gain		V_{OUT}/V_C , $V_C = 2.5 \text{ V}$, $R_L = 60 \Omega$	1.5	1.9	2.4	×	
TSD operating temperature	T _{STD}	*	150	180		°C	

Note: Items marked with an asterisk (*) are design target values, and are not tested.

Pin Assignment





Truth Table

Input Outp		Output	voltage	Operation	
IN1	IN2	OUT1	OUT2	Operation	
Н	Н	L	FULL	Forward (reverse) operation	
М	Н	L	$V_C \times 2$	Forward (reverse) operation	
L	Н	L	$V_C \times 2$	Forward (reverse) operation	
Н	М	OFF	OFF	Braking	
М	М	OFF	OFF	Braking	
L	М	OFF	OFF	Braking	
Н	L	FULL	L	Reverse (forward) operation	
М	L	V _C ×2	L	Reverse (forward) operation	
L	L	$V_C \times 2$	L	Reverse (forward) operation	

Input levels: V_H : Over 4.2 V V_M : 2.0 to 3.0 V V_L : Under 1.0 V

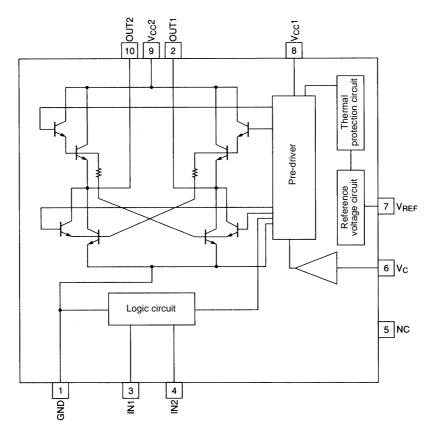
IN1 and IN2 go to 2.5 V when left open.

LB1943 operation is equivalent to that of the LB1641.

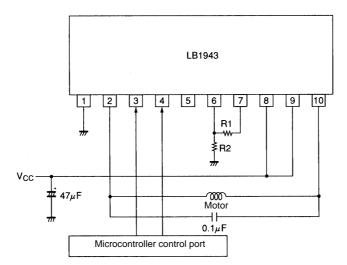
Pin Functions

Pin No.	Symbol	Pin function	Equivalent circuit
1	GND	Power system ground. This line is shared with the signal system ground.	
3	IN1	Output voltage switching input Goes to V _M (about 2.5 V) when left open.	V _{CC1} 25μA 19kΩ 13kΩ GND
4	IN2	 Forward, reverse, or braking control input Goes to V_M (about 2.5 V) when left open. 	V _{CC1} 75kΩ 25μA 19kΩ GND
6	Vc	Output voltage setting	6 GND
7	V_{REF}	• Reference voltage output. V _{REF} = 6.35 V	V _{CC1} 7
8	V _{CC} 1	Signal system power supply	
9	V _{CC} 2	Power system power supply	
2 10	OUT1 OUT2	Outputs that are connected to the motor coils	V _{CC2} 10 Out2 Q Out1 GND

Internal Equivalent Circuit



Peripheral Circuit Example



Usage Notes

- 1. The microprocessor output ports are CMOS outputs, and must be used in the high, low, or open states.
- 2. We recommend using a value of about 60 $k\Omega$ for R1 and R2.
- 3. Voltages applied to the IN1 and IN2 pins must not exceed the range 0 to 6 V. Note that negative voltages can cause the IC to operate incorrectly. Also, do not apply voltages to IN1 or IN2 when the V_{CC} voltage is not applied.
- 4. To prevent the upper and lower output transistors from both being in the on state at the same time, when switching the IN1 and IN2 values, always hold the input open for a brief period during the transition. We recommend holding the open state for a few tens of microseconds.
- 5. A capacitor must be inserted between V_{CC} and ground. We recommend that this capacitor have a value of at least $20\,\mu\text{F}$.

LB1943

- 6. During motor drive, large currents (on the order of several hundred mA) flow in the motor power supply block. Therefore, the printed circuit board layout and interconnections must be designed so that there are no shared devices.
- 7. If negative voltages are applied to OUT1 and OUT2 and the IC operates incorrectly, insert Schottky diodes between OUT1 and ground and between OUT2 and ground.

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