Ordering number : ENN5806A

Monolithic Digital IC

LB1943

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

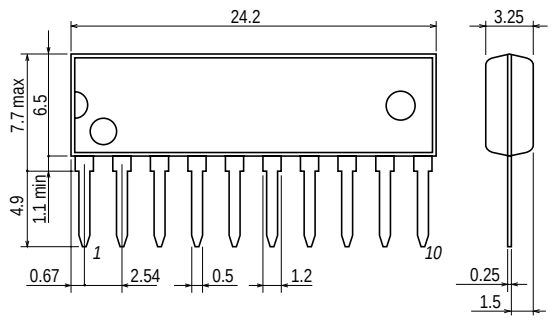
- Single-input control of forward, reverse, and braking operations
- Resistor output voltage setup
- Either full drive or VC drive can be selected from the single control input.
- Can be controlled from a microprocessor.
- Built-in motor dash current absorbing device
- Built-in reference voltage circuit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

Package Dimensions

unit: mm

3034A-SIP10

[LB1943]



SANYO: SIP10

Specifications

Absolute Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V_{CC} max		18	V
Input voltage	V_{IN}	$V_{CC} \geq V_{IN}$	–0.3 to +6	V
Output current	I_{OUT}		±1.6	A
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°C

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

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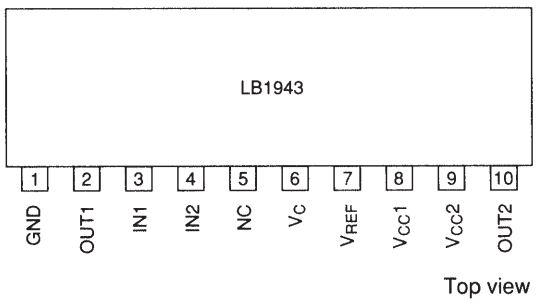
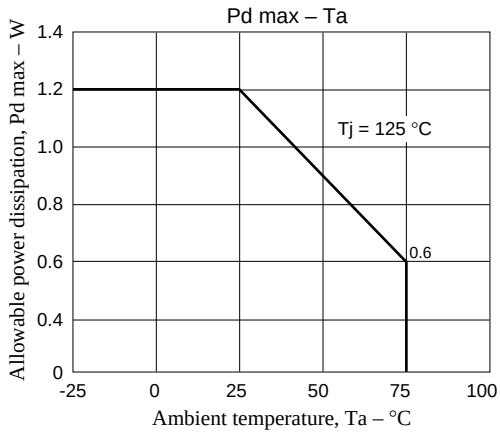
Electrical Characteristics at Ta = 25°C, V_{CC} = 12 V

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
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
Output voltage	$V_{OUT}1$	R_L = 60 Ω, V_C = 2.5 V $V_{IN}1$ = 2.5 V, $V_{IN}2$ = 0 V	4.4	4.95	5.4	V
	$V_{OUT}2$	R_L = 60 Ω, 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
Saturation voltage (upper)	V (sat)11	V_{CC} = 12V, I_{OUT} = 300 mA		1.9	2.2	V
	V (sat)12	V_{CC} = 12V, I_{OUT} = 500 mA		1.9	2.3	V
Saturation voltage (lower)	V (sat)21	V_{CC} = 12V, I_{OUT} = 300 mA		0.25	0.5	V
	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 V, R_L = 60 Ω	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



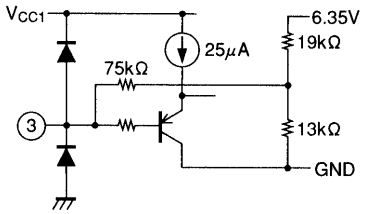
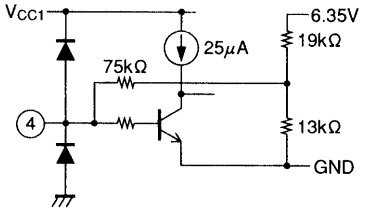
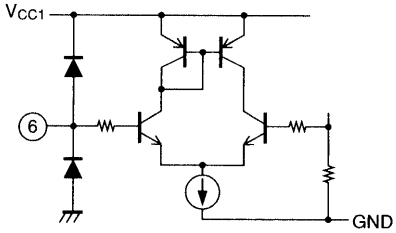
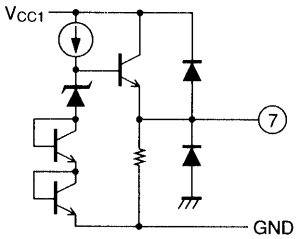
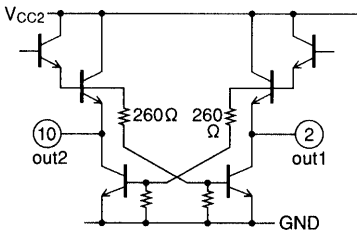


Truth Table

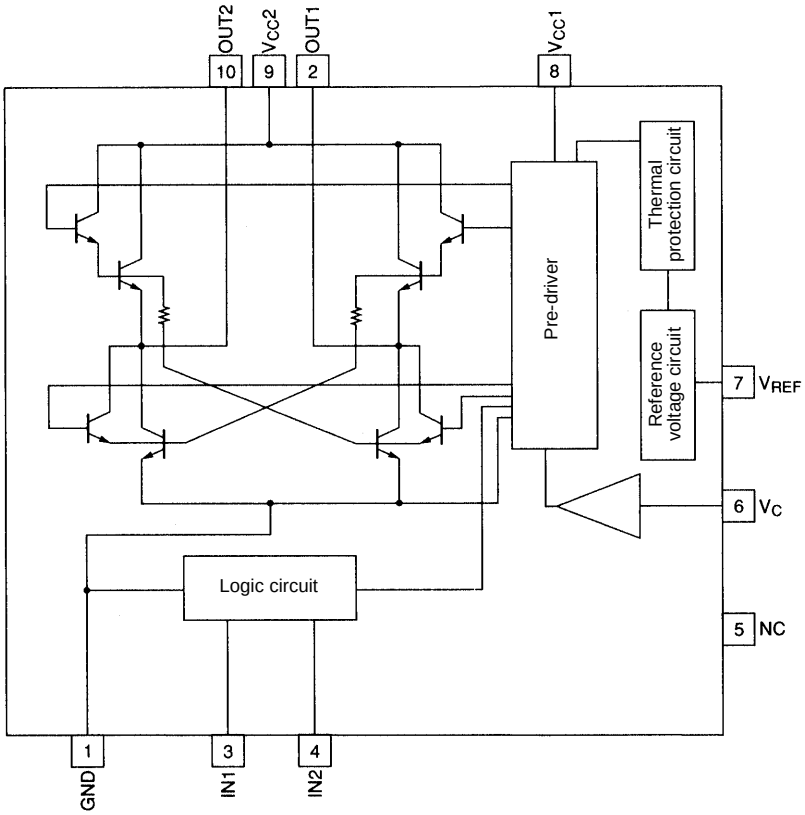
Input		Output voltage		Operation
IN1	IN2	OUT1	OUT2	
H	H	L	FULL	Forward (reverse) operation
M	H	L	$V_C \times 2$	Forward (reverse) operation
L	H	L	$V_C \times 2$	Forward (reverse) operation
H	M	OFF	OFF	Braking
M	M	OFF	OFF	Braking
L	M	OFF	OFF	Braking
H	L	FULL	L	Reverse (forward) operation
M	L	$V_C \times 2$	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.

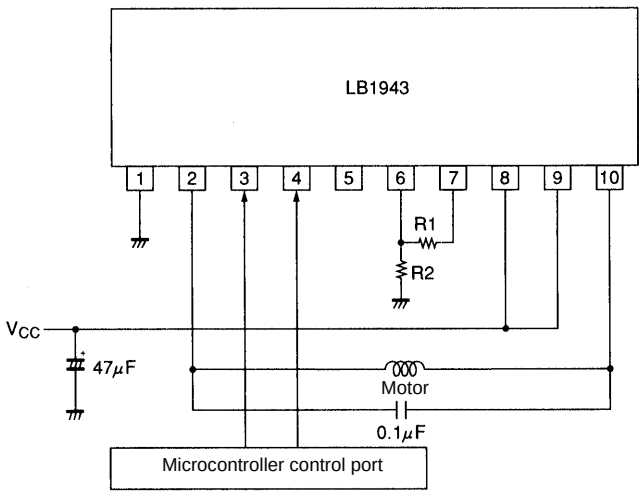
Pin Functions

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.	
4	IN2	• Forward, reverse, or braking control input • Goes to V_M (about 2.5 V) when left open.	
6	V_C	• Output voltage setting	
7	V_{REF}	• Reference voltage output. V_{REF} = 6.35 V	
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	

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 kΩ 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 μF.

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.