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# LB1838JM

Monolithic Digital IC

## Low-Saturation Bidirectional Motor Driver for Low-Voltage Drive

### Overview

The LB1838JM is a low-saturation two-channel bidirectional motor driver IC for use in low-voltage applications. It has a wide operating temperature range of -40 to 80°C and is ideal for 2-phase excitation bipolar stepping motor driver IC used in automotive components (other than critical safety parts), consumer and industrial products, and many other applications.

### Features

- Low voltage operation (2.5V min)
- Low saturation voltage (upper transistor + lower transistor residual voltage ; 0.40V typ at 400mA).
- Through-current prevention circuit built in
- Separate logic power supply and motor power supply
- Spark killer diodes built in
- Thermal shutdown circuit built in
- Compact package (14-pin MFP)

### Specifications

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

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	$V_{CC\ max}$		-0.3 to +10.5	V
	$V_S\ max$		-0.3 to +10.5	V
Output supply voltage	$V_{OUT}$		$V_S$ to $V_{SF}$	V
Input supply voltage	$V_{IN}$		-0.3 to +10	V
GND pin flow-out current	IGND	Per channel	1.0	A
Allowable power dissipation	$P_d\ max1$	Independent IC	550	mW
	$P_d\ max2$	* Mounted on a board.	800	mW
Operating temperature	$T_{opr}$		-40 to +85	°C
Storage temperature	$T_{stg}$		-55 to +150	°C

\* Mounted on a substrate :  $30 \times 30 \times 1.5\text{mm}^3$ , glass epoxy board.

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

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## Allowable Operating Ranges at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Supply voltage	V <sub>CC</sub>		2.5 to 9.0	V
	V <sub>S</sub>		1.8 to 9.0	V
Input high-level voltage	V <sub>IH</sub>		1.8 to 9.0	V
Input low-level voltage	V <sub>IL</sub>		-0.3 to +0.7	V

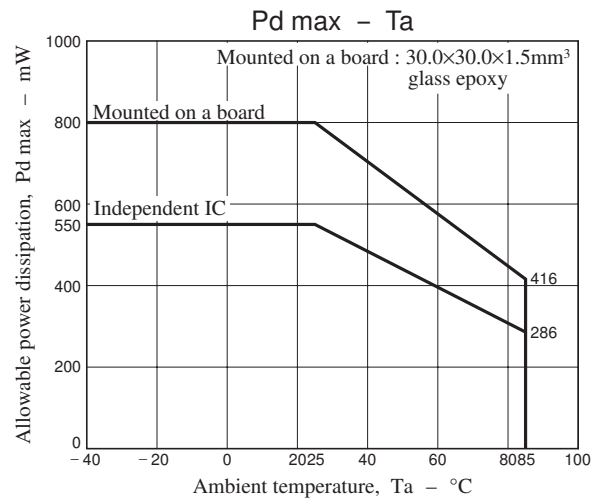
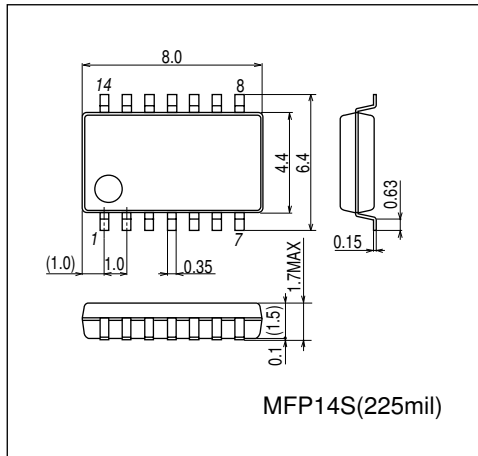
## Electrical Characteristics at Ta = 25°C, V<sub>CC</sub> = 3V

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Supply current	I <sub>CC0</sub>	EMA1, 2 = 0V, V <sub>IN1</sub> = 3V or 0V		0.1	10	μA
	I <sub>CC1</sub>	EMA1 = 3V, V <sub>IN1</sub> = 3V or 0V		12	18	mA
Output saturation voltage	V <sub>OUT1</sub>	EMA1 = 3V, V <sub>IN1</sub> = 3V or 0V, I <sub>OUT</sub> = 200mA		0.20	0.28	V
	V <sub>OUT2</sub>	EMA1 = 3V, V <sub>IN1</sub> = 3V or 0V, I <sub>OUT</sub> = 400mA		0.40	0.60	V
Input current	I <sub>IN</sub>	V <sub>CC</sub> = 6V, V <sub>IN</sub> = 6V			200	μA
	I <sub>ENA</sub>	V <sub>CC</sub> = 6V, ENA = 6V			200	μA
Output sustaining voltage	V <sub>O (SUS)</sub>	I <sub>OUT</sub> = 400mA	9			V
<b>Spark killer diode</b>						
Reverse current	I <sub>S (leak)</sub>	V <sub>CC1</sub> , V <sub>S</sub> = 7V			30	μA
Forward voltage	V <sub>SF</sub>	I <sub>OUT</sub> = 400mA			1.7	V

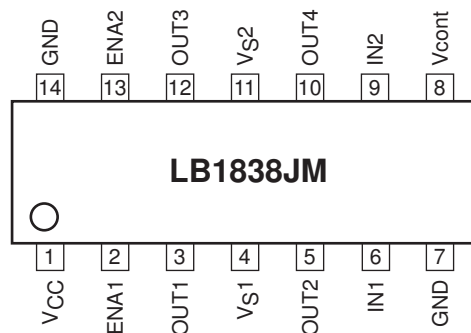
## Package Dimensions

unit : mm (typ)

3111A



## Pin Assignment

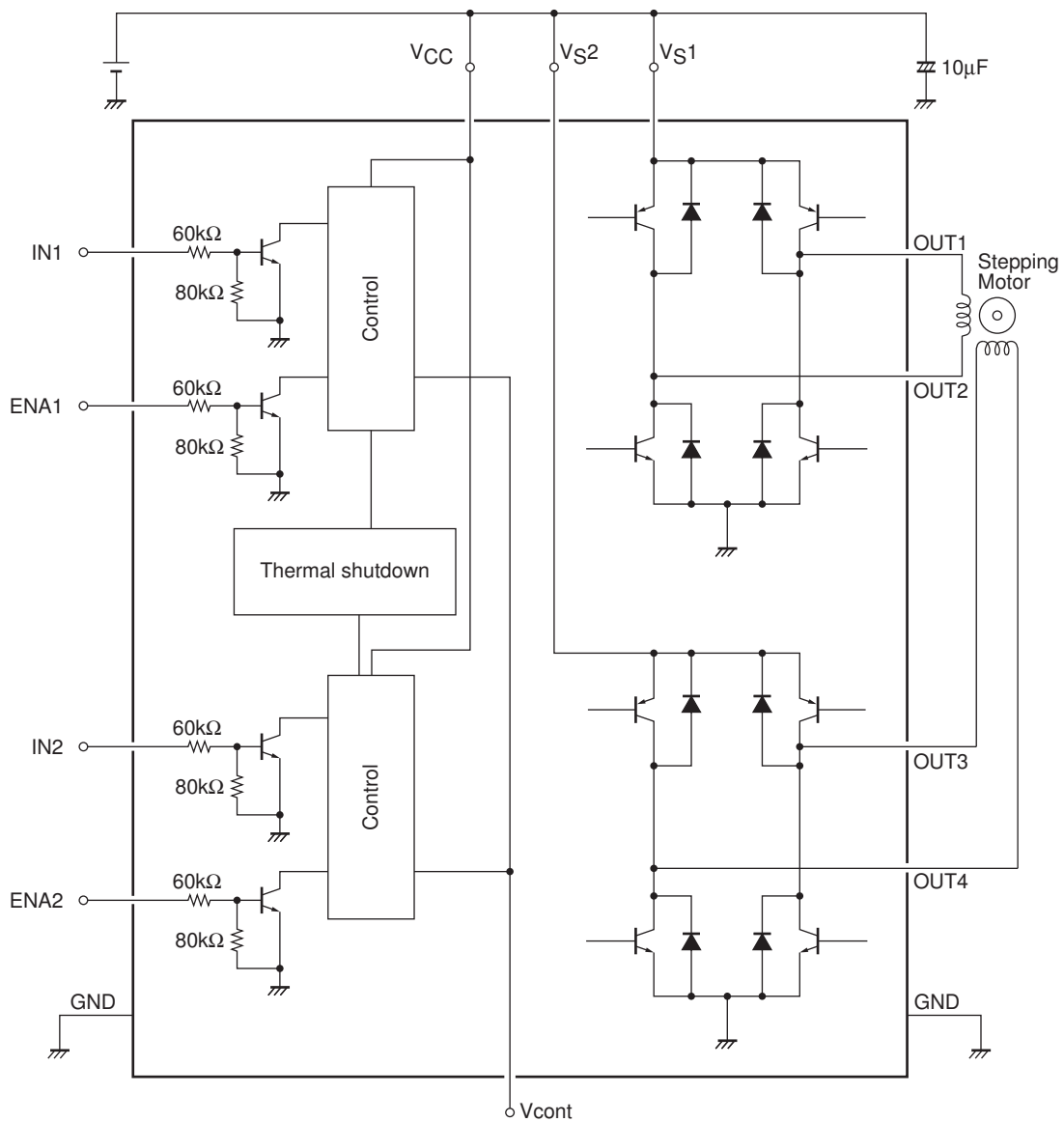


Top view

Note) Ground both GND pins.

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## Block Diagram

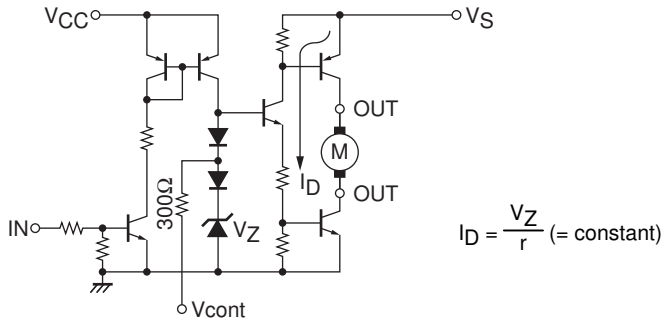


\* : As long as the voltages applied to  $V_{CC}$ ,  $V_{S1}$ ,  $V_{S2}$ ,  $EN_{A1}$ ,  $EN_{A2}$ ,  $IN_1$  and  $IN_2$  are within the limits set by the absolute maximum ratings, there are no restrictions on the relationship of each voltage level in comparison with the others (regarding which is higher or lower). (ex.  $V_{CC} = 3V$ ,  $V_{S1, 2} = 2V$ ,  $EN_A = IN = 5V$ )

### Truth Table

IN1/2	ENA1/2	OUT1/3	OUT2/4	Mode
L	H	H	L	Forward
H	H	L	H	Reverse
L	L	OFF	OFF	Standby
H	L	OFF	OFF	Standby

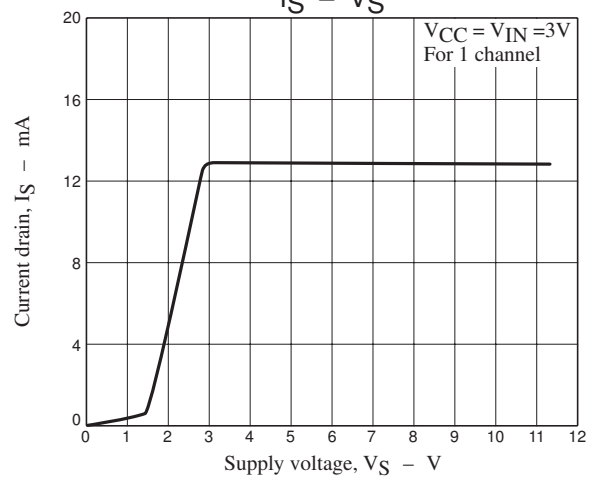
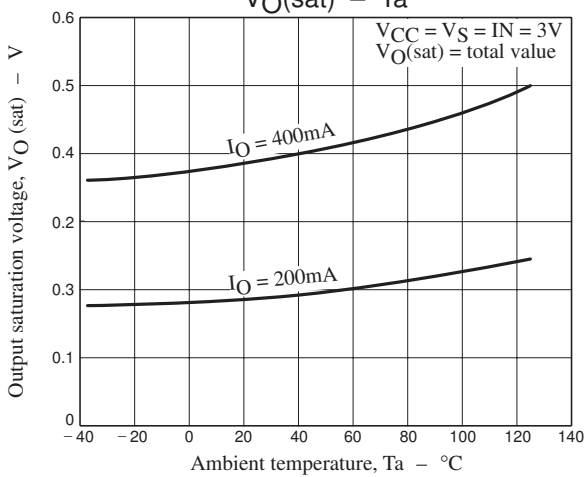
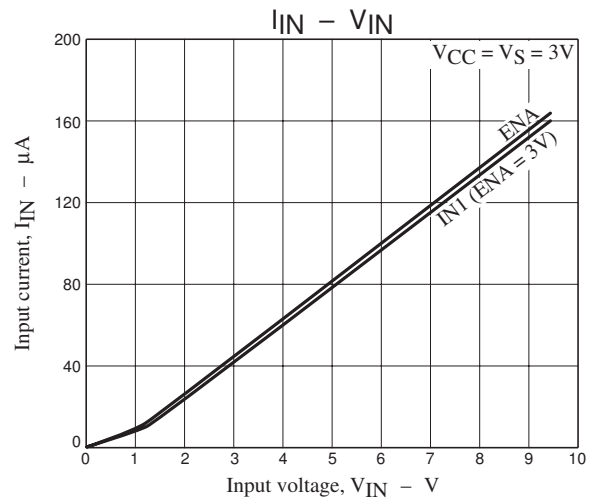
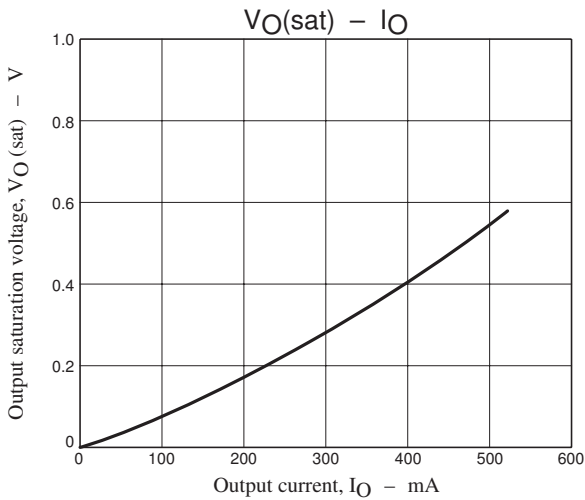
Vcont pin



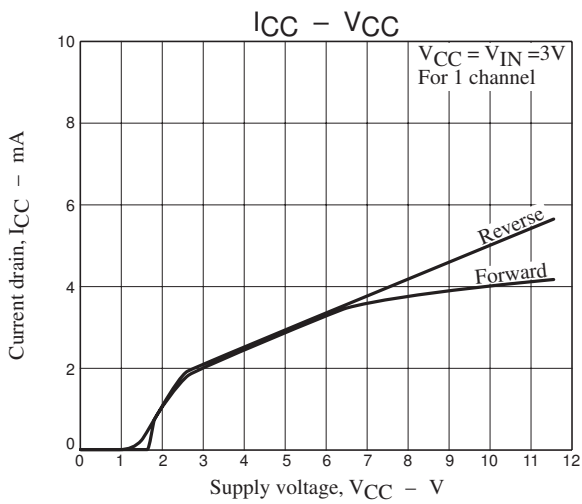
As shown in the above diagram, the Vcont pin outputs the voltage of the band gap Zener  $V_Z + V_F (=1.93V)$ .

In normal use, this pin is left open.

The drive current  $I_D$  is varied by the Vcont voltage. However, because the band gap Zener is shared, it functions as a bridge.



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