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SANYO Semiconductors
DATA SHEET

LV8401V — Bi-CMOS IC
Forward/Reverse Motor Driver

Overview

LV8401T is a 1ch forward/reverse motor driver IC using D-MOS FET for output stage. As MOS circuit is used, it supports the PWM input. Its features are that the on resistance (0.35Ω typ) and current dissipation are low.

It also provides protection functions such as heat protection circuit and reduced voltage detection and is optimal for the motors that need high-current.

Functions

- 1ch forward/reverse motor driver
- Low power consumption
- Low-temperature resistance 0.6Ω

- Built-in constant current output circuit
- Built-in low voltage reset and thermal shutdown circuit
- Four mode function forward/reverse, brake, stop.

Specifications

Maximum Ratings at Ta = 25°C, SGND = PGND = 0V

Parameter	Symbol	Conditions	Ratings	Unit
Power supply voltage (for load)	VM max		-0.5 to 18.0	V
Power supply voltage (for control)	V_{CC} max		-0.5 to 6.0	V
Output current	I_O max	DC	1.2	A
	I_O peak1	t ≤ 100ms, f = 5Hz	2.0	A
	I_O peak2	t ≤ 10ms, f = 5Hz	3.8	A
	I_{OUT} max	DC	30	mA
Input voltage	V_{IN} max		-0.5 to V_{CC}+0.5	V
Allowable power dissipation	Pd max	*Mounted on a specified board	800	mW
Operating temperature	Topr		-20 to +75	°C
Storage temperature	Tstg		-55 to +150	°C

* Specified board : 30mm×50mm×1.6mm, glass epoxy board

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Allowable Operating Conditions at Ta = 25°C, SGND = PGND = 0V

Parameter	Symbol	Conditions	Ratings	Unit
Power supply voltage (for load)	VM		4.0 to 16.0	V
Power supply voltage (for control)	V_{CC}		2.7 to 5.5	V
Input signal voltage	V_{IN}		0 to V_{CC}	V
Input signal frequency	f max	Duty = 50%	200	kHz

Electrical Characteristics Ta = 25°C, V_{CC} = 5.0V, VM = 12.0V, SGND = PGND = 0V, unless otherwise specified.

Parameter		Symbol	Conditions	Remarks	Ratings min	Ratings typ	Ratings max	Unit
Standby load current drain 1		IMO1	EN = 0V	1			1.0	μA
Standby load current drain 2		IMO2	EN = 0V, V_{CC} = 0V, Each input pin = 0V	1			1.0	μA
Standby control current drain		ICO	EN = 0V, IN1 = IN2 = 0V	2	12.5	25	50	μA
Operating load current drain 1		IM1	V_{CC} = 3.3V, EN = 3.3V	3		0.5	1.0	mA
Operating load current drain 2		IM2	V_{CC} = 5.0V, EN = 5V	3		0.5	1.0	mA
Operating current consumption 1		IC1	V_{CC} = 3.3V, EN = 3.3V	4		0.6	1.2	mA
Operating current consumption 2		IC2	V_{CC} = 5.0V, EN = 5V	4		0.8	1.6	mA
High-level input voltage		V_{IH}	$2.7 \leq V_{CC} \leq 5.5$V		$0.6 \times V_{CC}$		V_{CC}	V
Low-level input voltage		V_{IL}	$2.7 \leq V_{CC} \leq 5.5$V		0		$0.2 \times V_{CC}$	V
High-level input current (IN1, IN2, ICTRL)		I_{IH}	V_{IN} = 5V	5	12.5	25	50	μA
Low-level input current (IN1, IN2, ICTRL)		I_{IL}	V_{IN} = 0V	5	-1.0			μA
Pull-up resistance value (EN)		RUP		5	100	200	400	kΩ
Pull-down resistance value (IN1, IN2, ICTRL)		RDN		5	100	200	400	kΩ
Output ON resistance		RON	Sum of top and bottom sides ON resistance. $2.7V \leq V_{CC} \leq 5.5$V	6		0.35	0.6	Ω
Constant current output leakage current		I_OREAK	EN = 0V	7			1.0	μA
Output constant current		I_{OUT}	RSET = 40Ω, Internal reference = 0.2V	8	4.5	5.0	5.5	mA
ISET pin voltage		VISET	RSET = 40Ω	9	0.18	0.20	0.22	V
Constant current output ON resistance		RONIO	RSET = 0Ω, I_O = 5mA	10		30	40	Ω
Low-voltage detection voltage		VCS	V_{CC} pin	11	2.1	2.25	2.4	V
Thermal shutdown temperature		Tth	* Design target	12	150	180	210	°C
Output block	Turn-on time	TPLH		13		0.5	1.0	μS
	Turn-off time	TPHL		13		0.5	1.0	μS

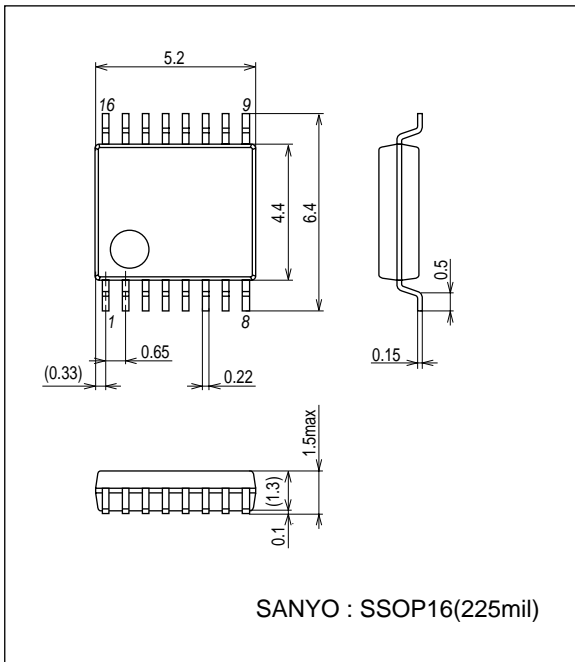* : Design target value and no measurement is performed.

Remarks
1. Current consumption when output at the VM pin is off.
2. Current consumption at the V_{CC} pin when in standby mode.
3. Current consumption at the VM pin when EN is high.
4. Current consumption at the V_{CC} pin when EN is high.
5. These input pins (IN1, IN2, and ICTRL) have an internal pull-down resistor and the EN pin an internal pull-up resistor.
6. Sum of the top and bottom side output on resistance.
7. Leakage current when the constant current output is off.
8. Current value that is determined by dividing the internal reference voltage (0.2V) by RSET.
9. ISET pin voltage when the constant current output block is active.
10. ON resistance value of the constant current output block.
11. All output transistors are turned off if a low-voltage is detected.
12. All output transistors are turned off if the thermal protection circuit is activated. They are turned on again as the temperature goes down.
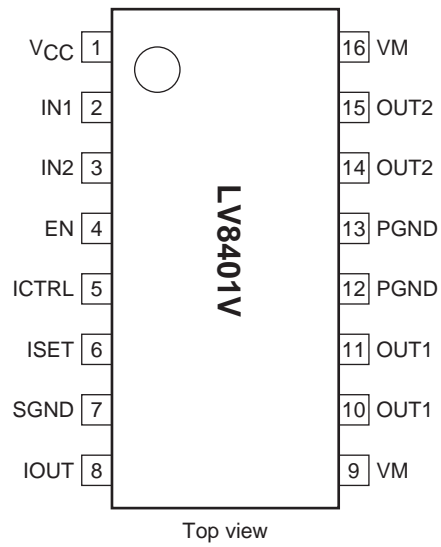13. Rising time from 10 to 90% and falling time from 90 to 10% are specified.

Package Dimensions

unit : mm (typ)

3178B
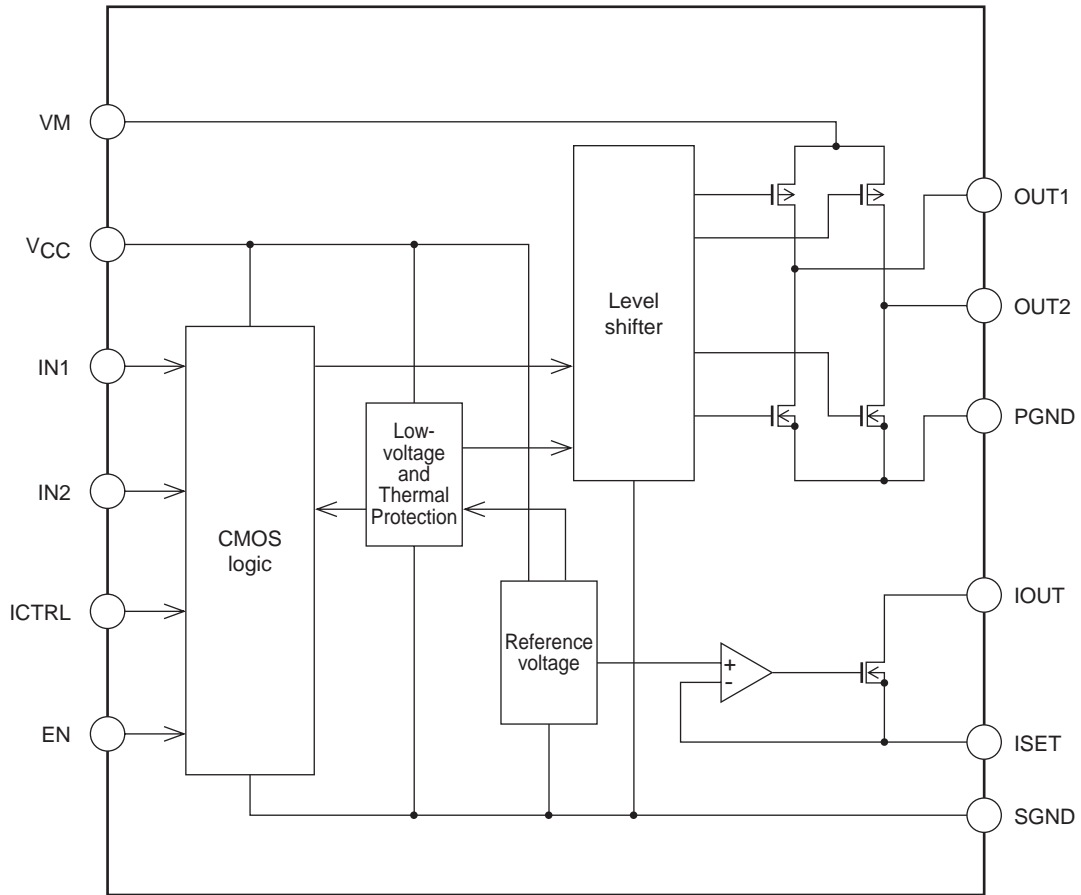
5.2

16

9

4.4

6.4

1

8

0.65

(0.33)

0.22

0.5

0.15

1.5max

(1.3)

0.1

SANYO : SSOP16(225mil)

Pin Assignment

VCC	1	16	VM
IN1	2	15	OUT2
IN2	3	14	OUT2
EN	4	13	PGND
ICTRL	5	12	PGND
ISET	6	11	OUT1
SGND	7	10	OUT1
IOUT	8	9	VM

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Top view

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Block Diagram

Truth Table

EN	IN1	IN2	OUT1	OUT2	Mode
H	H	H	L	L	Brake
	H	L	H	L	Forward
	L	H	L	H	Reverse
	L	L	Z	Z	Standby
L	-	-	Z	Z	Standby

EN	ICTRL	IOUT	Mode
H	H	ON	Constant current ON
	L	Z	Constant current OFF
L	-	Z	Standby

- : denotes a don't care value. Z : High-impedance

- Current drain is zero in standby mode. (excluding the current that flows out of the EN pin)
* All power transistors turn off and the motor stops driving when the IC is detected in low voltage or thermal protection mode.

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Pin Functions

Pin No.	Pin name	Description	Equivalent circuit
9 16	VM	Motor block power supply. (Both pins must be connected)	
1	V_{CC}	Logic block power supply.	
4	EN	Logic enable pin. (Pull-up resistor incorporated)	
2 3 5	IN1 IN2 ICTRL	Driver output switching. (Pull-down resistor incorporated)	
10 11 14 15	OUT1 OUT2	Driver output.	
6 8	ISET I_{OUT}	Constant current output.	
7	SGND	Logic block ground.	
12 13	PGND	Driver block ground. (Both pins must be connected)	

Sample Application Circuit
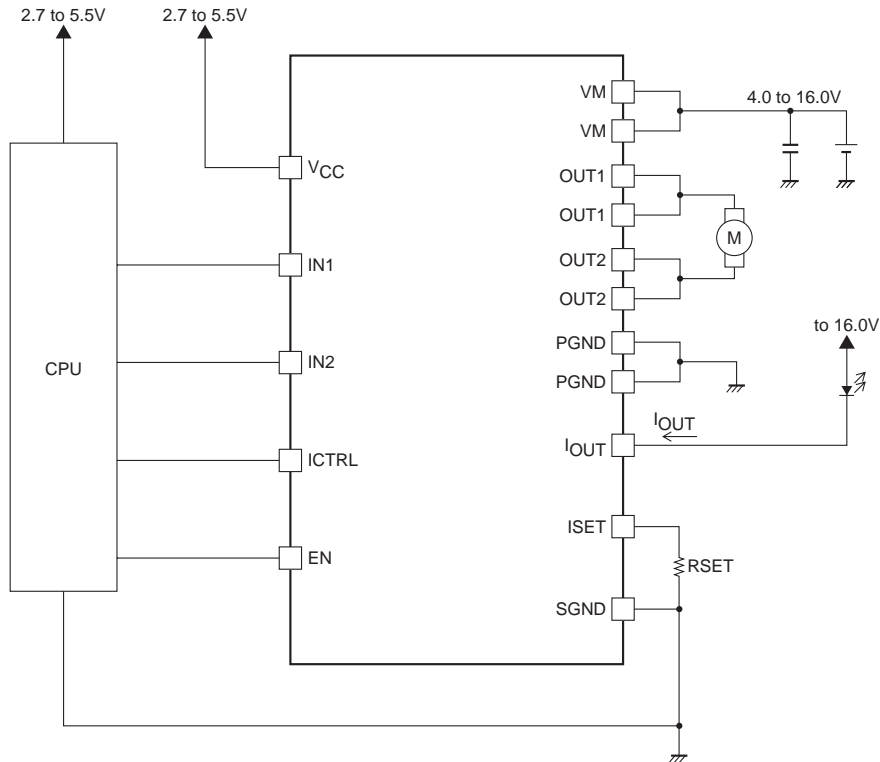
*1 : Connect a kickback absorbing capacitor as close as possible to the IC. Characteristics deterioration of the IC or damage may result if an instantaneous voltage surge exceeding the maximum rated value is applied to the VM line due to coil kickback or other causes.

*2 : The output constant current (I_{OUT}) is determined by the internal reference voltage and the sense resistor between the ISET and SGND pins.

I_{OUT} = Internal reference voltage (0.2V) ÷ Sense resistor (RSET)

From the formula above, I_{OUT} = 5mA when a sense resistor of 40Ω is connected between the ISET and SGND.

This catalog provides information as of August, 2007. Specifications and information herein are subject to change without notice.