



ON Semiconductor®

<http://onsemi.com>

LV8401V

Bi-CMOS IC Forward/Reverse Motor Driver

Overview

The LV8401V is a 1-channel motor driver IC using D-MOS FET for output stage and operates in one of the four modes under program control: forward, reverse, brake, and standby.

As the P/N-channel structure is used in the H-bridge output stage, the LV8401V features minimal number of external component and low on-resistance (0.33Ω typical). This IC is optimal for driving motors that need large-current.

Functions

- 1-channel forward/reverse motor driver
- Low power consumption
- Low output ON resistance 0.33Ω
- Built-in constant current output circuit
- Built-in low voltage reset and thermal shutdown circuit
- Four mode function forward/reverse, brake, standby.

Specifications

Maximum Ratings at $T_a = 25^\circ\text{C}$, $\text{SGND} = \text{PGND} = 0\text{V}$

Parameter	Symbol	Conditions	Ratings	Unit
Power supply voltage (for load)	V_M max		-0.5 to 16.0	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	$t \leq 100\text{ms}$, $f = 5\text{Hz}$	2.0	A
	I_O peak2	$t \leq 10\text{ms}$, $f = 5\text{Hz}$	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	P_d max	Mounted on a specified board *	800	mW
Operating temperature	T_{opr}		-20 to +75	$^\circ\text{C}$
Storage temperature	T_{stg}		-55 to +150	$^\circ\text{C}$

* Specified board : $30\text{mm} \times 50\text{mm} \times 1.6\text{mm}$, 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.

LV8401V

Allowable Operating Conditions at $T_a = 25^\circ\text{C}$, $\text{SGND} = \text{PGND} = 0\text{V}$

Parameter	Symbol	Conditions	Ratings	Unit
Power supply voltage (for load)	VM		4.0 to 15.0	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 $T_a = 25^\circ\text{C}$, $V_{CC} = 5.0\text{V}$, $V_M = 12.0\text{V}$, $\text{SGND} = \text{PGND} = 0\text{V}$, unless otherwise specified.

Parameter	Symbol	Conditions	Remarks	Ratings			Unit
				min	typ	max	
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		0.35	0.70	mA
Operating load current drain 2	IM2	V _{CC} = 5.0V, EN = 5.0V	3		0.35	0.70	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 = 5.0V	4		0.8	1.6	mA
High-level input voltage	V _{IH}	$2.7 \leq V_{CC} \leq 5.5\text{V}$		$0.6 \times V_{CC}$		V _{CC}	V
Low-level input voltage	V _{IL}	$2.7 \leq V_{CC} \leq 5.5\text{V}$		0		$0.2 \times V_{CC}$	V
High-level input current (IN1, IN2, ICTRL)	I _{IH}	V _{IN} = 5.0V	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)	R _{UP}			100	200	400	kΩ
Pull-down resistance value (IN1, IN2, ICTRL)	R _{DN}			100	200	400	kΩ
Output ON resistance	R _{ON}	Sum of top and bottom sides ON resistance. $2.7\text{V} \leq V_{CC} \leq 5.5\text{V}$	6		0.33	0.5	Ω
Constant current output leakage current	I _O LEAK	EN = 0V	7			1.0	μA
Output constant current	I _{OUT}	RSET = 40Ω, Internal reference = 0.2V	8	4.65	5.00	5.35	mA
ISET pin voltage	V _{ISET}	RSET = 40Ω	9	0.186	0.20	0.214	V
Constant current output ON resistance	R _{ON} I _O	RSET = 0Ω, I _O = 5mA	10		20	30	Ω
Low-voltage detection voltage	VCS	V _{CC} voltage	11	2.10	2.25	2.40	V
Thermal shutdown temperature	T _{th}	Design guarantee *	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 guarantee value and no measurement is performed.

Remarks

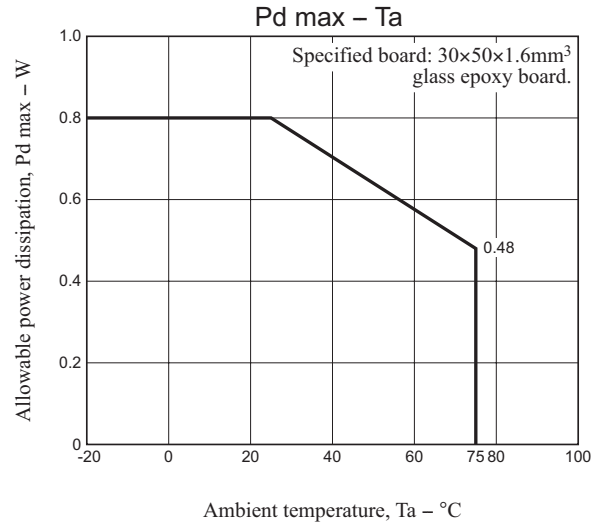
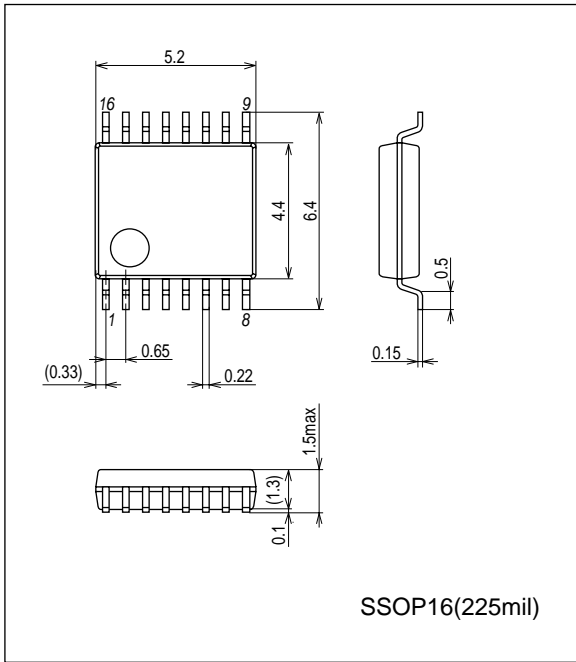
1. Current consumption when output at the VM pin is off.
2. Current consumption at the V_{CC} pin when in all function stop mode.
3. Current consumption at the VM pin when EN is high.
4. Current consumption at the V_{CC} pin when EN is high.
5. These input pins (IN1, IN2, and ICTRL) have an internal 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.

LV8401V

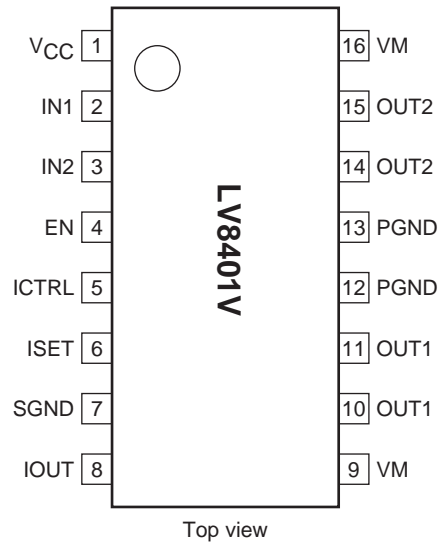
Package Dimensions

unit : mm (typ)

3178B

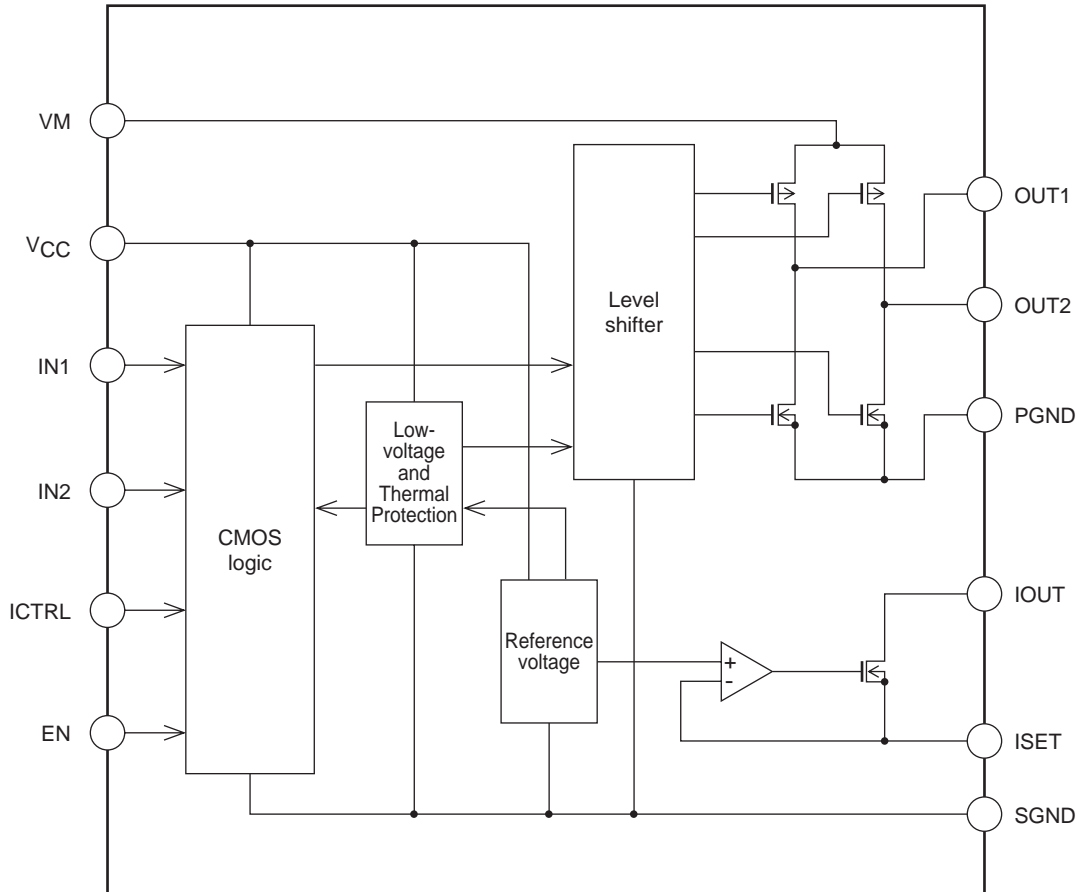


Pin Assignment



LV8401V

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	All function stop

EN	ICTRL	IOUT	Mode
H	H	ON	Constant current ON
	L	Z	Constant current OFF
L	-	Z	All function stop

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

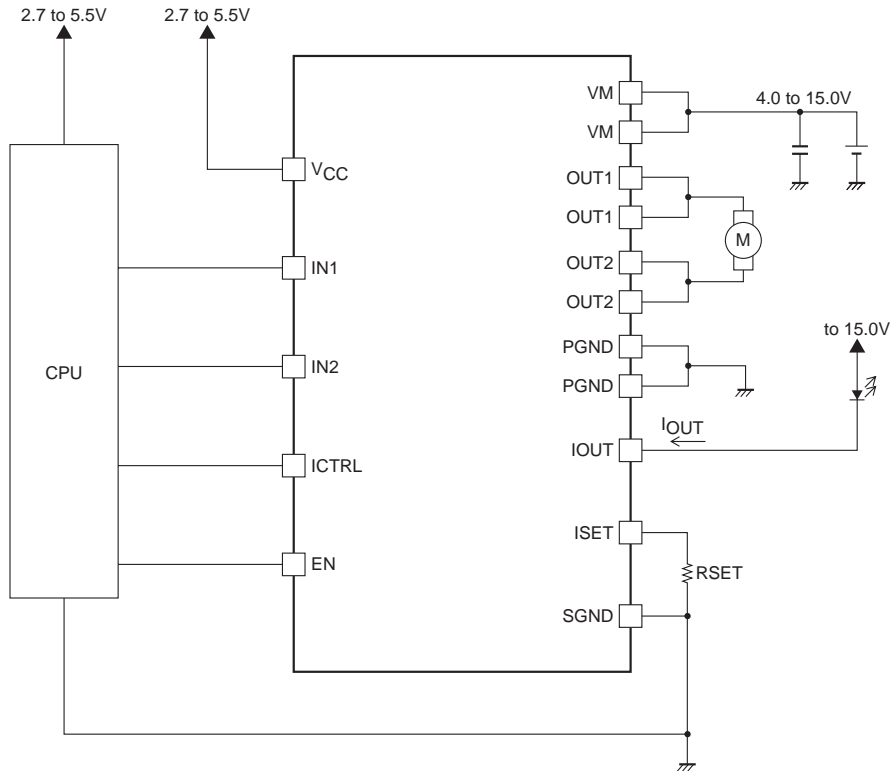
- Current drain is zero in all function stop mode. (excluding the current that flows out of the EN pin)
- * All power transistors turn off and the motor stops driving when the IC is detected in low voltage or thermal protection mode.

LV8401V

Pin Functions

Pin No.	Pin name	Description	Equivalent circuit
9 16	VM	Motor block power supply. (Both pins must be connected)	
1	VCC	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 IOUT	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.
 $I_{OUT} = \text{Internal reference voltage (0.2V)} \div \text{Sense resistor (RSET)}$

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

ON Semiconductor and the ON logo are registered trademarks of Semiconductor Components Industries, LLC (SCILLC). SCILLC owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of SCILLC's product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. SCILLC reserves the right to make changes without further notice to any products herein. SCILLC makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does SCILLC assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. "Typical" parameters which may be provided in SCILLC data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. SCILLC does not convey any license under its patent rights nor the rights of others. SCILLC products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the SCILLC product could create a situation where personal injury or death may occur. Should Buyer purchase or use SCILLC products for any such unintended or unauthorized application, Buyer shall indemnify and hold SCILLC and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that SCILLC was negligent regarding the design or manufacture of the part. SCILLC is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

Looking for pricing, stock, or lifecycle information?

Click below to explore more details on WIN SOURCE:

-  [View LV8401V-MPB-E on WIN SOURCE](#)
-  [ON Semiconductor](#) Information

Optimize Your Supply Chain with WIN SOURCE Solutions

-  Global Sourcing Solution
-  Obsolete Management
-  Cost Control Management
-  Shortage Management
-  Alternative Solution
-  Excess Inventory Management