Ordering number : ENA1134A

SANYO Semiconductors
DATA SHEET

An ON Semiconductor Company

LV8014T — Bi-CMOS LSI Forward/Reverse Motor Driver

Overview

LV8014T is a 2ch 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 (0.75Ω 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

- 2ch forward/reverse motor driver
- Low power consumption
- Built-in charge pump circuit
- Compact TSSOP-24 package
- Possible to respond to 3V control voltage and 6V motor voltage device
- Low ON resistance 1.2Ω
- Built-in low voltage reset and thermal shutdown circuit
- Four mode function forward/reverse, brake, stop.

Specifications

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

Parameter	Symbol	Conditions	Ratings	Unit
Supply voltage (For load)	VM1, 2 max		-0.5 to 7.5	V
Supply voltage (For control)	V_{CC} max		-0.5 to 6.0	V
Output current	I_O max	t ≤ 100ms	1.4	A
Output peak current	I_O max2	t ≤ 10ms	2.5	A
Input voltage	V_{IN} max		-0.5 to V_{CC}+0.5	V
Allowable dissipation	Pd max	* Mounted on a substrate	800	mW
Operating temperature	Topr		-20 to +75	°C
Storage temperature	Tstg		-55 to +150	°C

* : Mounted on a substrate : 30×50×1.6mm^3, glass epoxy board

Caution 1) Absolute maximum ratings represent the value which cannot be exceeded for any length of time.
Caution 2) Even when the device is used within the range of absolute maximum ratings, as a result of continuous usage under high temperature, high current, high voltage, or drastic temperature change, the reliability of the IC may be degraded. Please contact us for the further details.

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

Parameter	Symbol	Conditions	Ratings	Unit
Supply voltage (VM Pin)	VM		2.0 to 7.0	V
Supply voltage (V_{CC} Pin)	V_{CC}		2.7 to 5.5	V
Input signal voltage	V_{IN}		0 to V_{CC}	V
Input signal frequenc	f max		100	kHz
Capacitor for charge pump	C1, C2, C3		0.001 to 0.1	μF

Electrical Characteristics at Ta = 25°C, V_{CC} = VM1 = VM2 = 5.0V, SGND = PGND = 0V, unless especially specified.

Parameter	Symbol	Conditions	Remarks	Ratings			Unit
				min	typ	max	
Supply current for load at standby	IMO	EN = 0V	1			1.0	μA
Supply current for control at standby	ICO	EN = 0V, IN1 = IN2 = IN3 = IN4 = 0V	2			1.0	μA
Current drain during operation	IC1	EN = 5V, VG at no load	3		0.7	1.2	mA
H-level input voltage	V_{IH}	2.7V ≤ V_{CC} ≤ 5.5V		0.6×V_{CC}		V_{CC}	V
L-level input voltage	V_{IL}	2.7V ≤ V_{CC} ≤ 5.5V		0		0.2×V_{CC}	V
H-level input current (IN1, IN2, IN3, IN4)	I_{IH}		4			1.0	μA
L-level input current (IN1, IN2, IN3, IN4)	I_{IL}		4	-1.0			μA
Pull-down resistance (EN1, 2)	RUP			100	200	400	kΩ

Ta = 25°C, V_{CC} = VM = 5.0V, SGND = PGND = 0V

Parameter		Symbol	Conditions	Remarks	Ratings			Unit
					min	typ	max	
Output ON resistance		RON	Sum of ON resistances at top and bottom	5		0.75	1.2	Ω
Charge pump voltage		VG		6	8.5		10.5	V
Low-voltage detection operation voltage		VCS		7	2.15	2.30	2.45	V
Thermal shutdown operation temperature		Tth		8		180		°C
Charge pump capacity (IG = 500μA)		VGLOAD		9	8	9		V
IG current dissipation (Fin = 20kHz)		IG		10			350	μA
Charge pump start time		TVG	CVG = 0.1μF	11			1.0	ms
Output block	Turn on time	TPLH		12		0.2	0.4	μs
	Turn off time	TPHL		12		0.2	0.4	μs

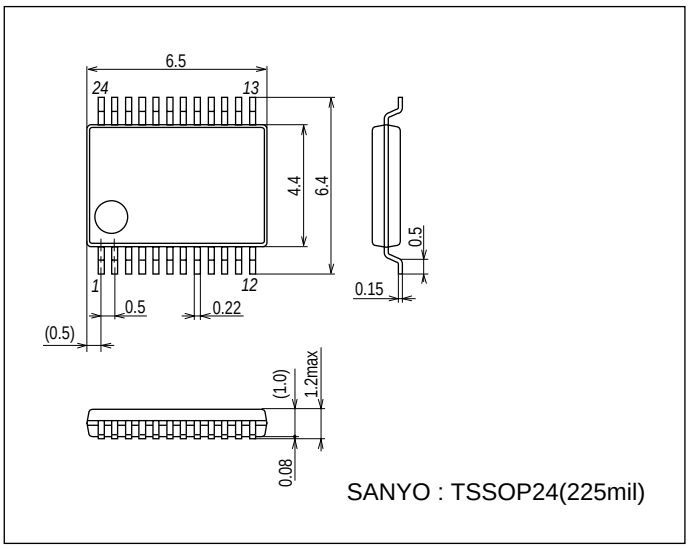
Remarks

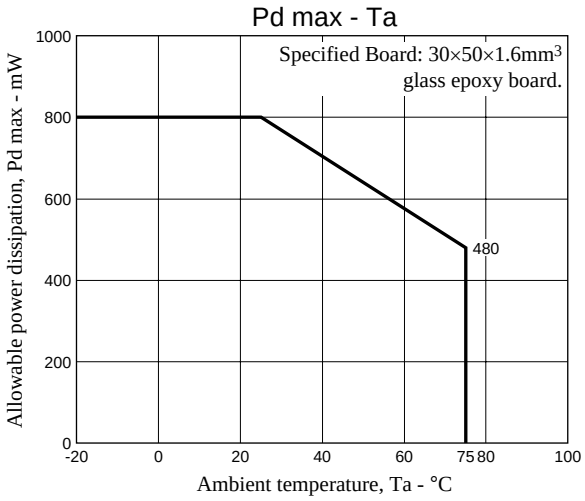
1. It shows current dissipation of VM1, VM2 pin in output OFF state.
2. It shows current dissipation of V_{CC} pin in stand-by state.
   (The standard current depends on EN pin pull-down resistance.)
3. It shows current dissipation of V_{CC} pin in state of EN = 5V (stand-by), including current dissipation of VG pin.
4. For IN1, IN2, IN3 and IN4 pins, no pull-down and pull-up resistance is needed. (High impedance pin)
5. It shows sum of upper and lower saturation voltages of OUT pin.
6. It controls charge-pump oscillation and makes specified voltage.
7. When low voltage is detected, the lower output is turned OFF.
8. When thermal protection circuit is activated, the lower output is turned OFF.
   When the heat temperature is fallen, it is turned ON again.
9. IG (VG pin load current) = 500μA
10. It shows VG pin current dissipation in state of PWM input for IN pin.
11. It specifies start-up time from 10% to 90% when VG is in non-load state
    (when setting the capacitor between VG and GND to 0.1μF and V_{CC} is 5V).
12. It specifies 10% to 90% for start-up and 90% to 10% for shut-down.

Package Dimensions

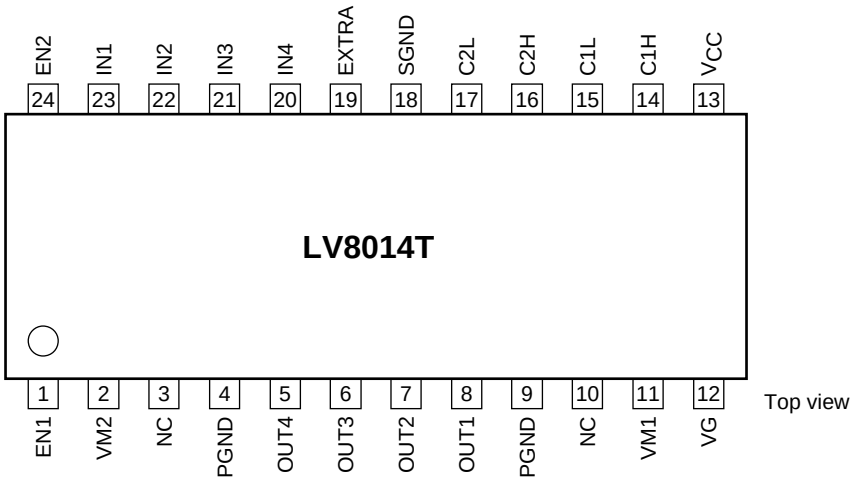
unit : mm (typ)

3260A

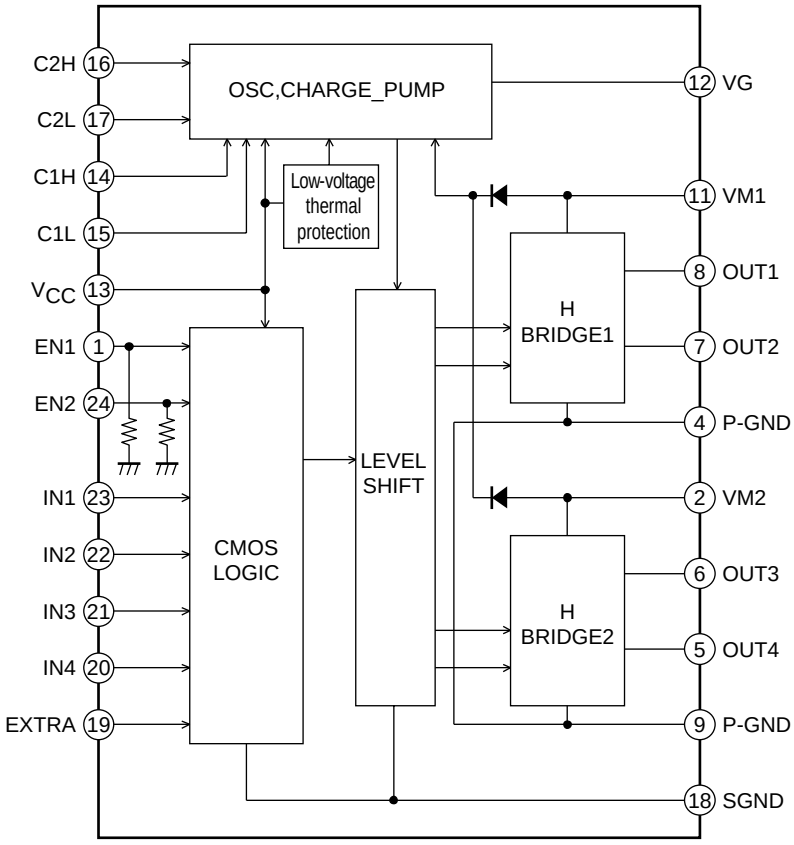




Pin Assignment



Block Diagram



Truth table

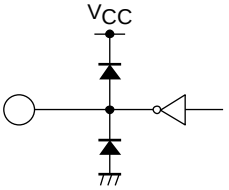
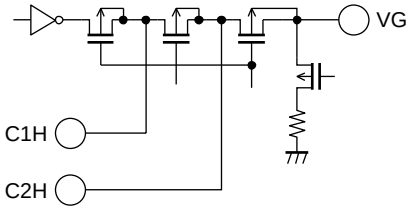
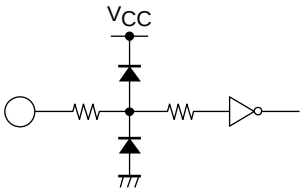
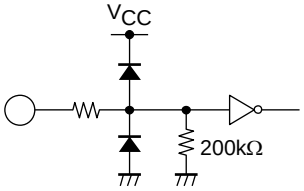
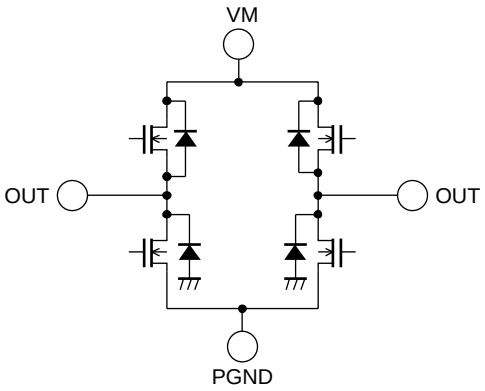
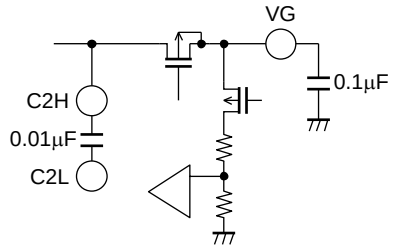
EXTRA	EN1 (EN2)	IN1 (IN3)	IN2 (IN4)	OUT1 (OUT3)	OUT2 (OUT4)	Circuit of Charge Pump	Mode
L	H	H	H	Z	Z	ON	Standby
		H	L	L	H		Reverse
		L	H	H	L		Forward
		L	L	L	L		Brake
	L	-	-	L	L	OFF	Standby
H	H	H	-	L	H	ON	Reverse
		L	-	H	L		Forward
	L	-	-	L	L		Brake

- : Don't care Z : High-Impedance

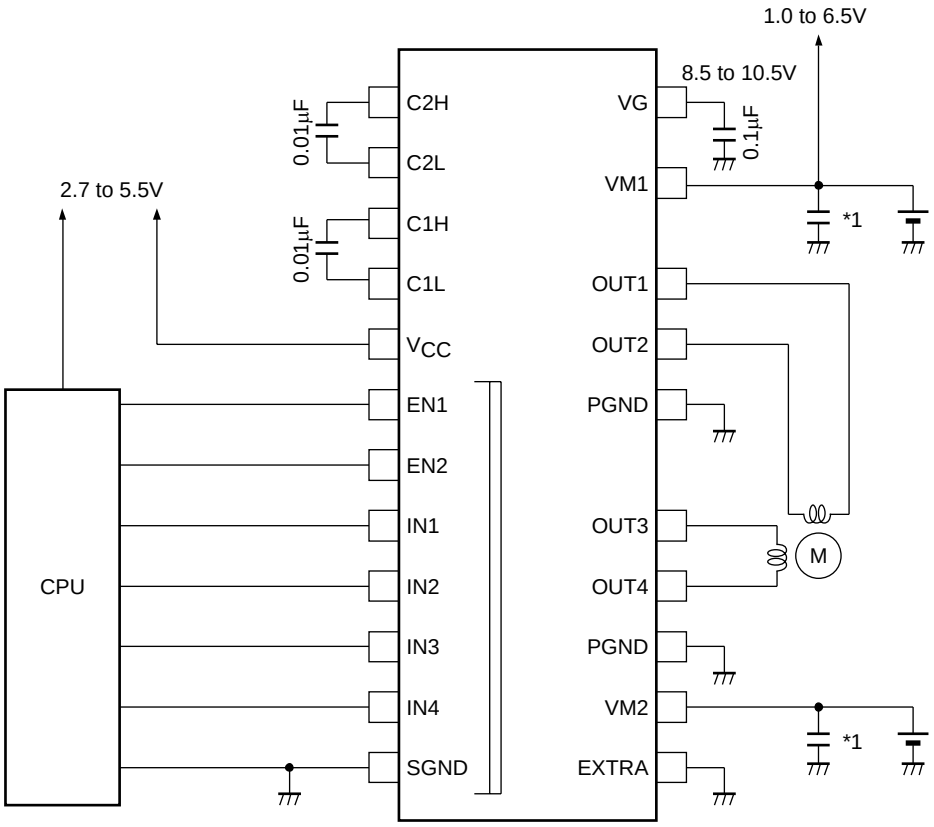
* Current drain becomes zero in the standby mode.

* The output side becomes OFF, with motor drive stopped, during voltage reduction and thermal protection.

Pin Functions

Pin No.	Pin name	Function	Equivalent Circuit
15 17	C1L C2L	Voltage raising capacitor connection pin	
14 16	C1H C2H	Voltage raising capacitor connection pin	
23 22 21 20 19	IN1 IN2 IN3 IN4 EXTRA	Driver output changeover	
1 24	EN1 EN2	Logic enable pin TOUT output control pin (Pull-down resistor incorporated)	
8 7 6 5	OUT1 OUT2 OUT3 OUT4 PGND	Driver output pin	
2 11	VM2 VM1	Motor power supply	
13	V_{CC}	Logic power supply	
12	VG	Driver drive circuit power supply	
18	SGND	Logic GND	
9 4	PGND PGND	Driver GND (both terminals to be connected)	

Sample Application Circuit



*1 : Connect a kickback absorption capacitor directly near IC. Coil kickback may cause rise of the voltage of VM line, and the voltage exceeding the maximum rating may be applied momentarily, resulting in deterioration or damage of IC.