



LV8402GP

Bi-CMOS IC

2ch Forward/Reverse Motor Driver

Overview

LV8402GP 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.
- Low ON resistance 0.75Ω.
- Built-in low voltage reset and thermal shutdown circuit.
- 4 mode function forward/reverse, brake and standby.
- Built-in charge pump.
- Built-in EXTRA mode for PWM port reduction when a motor drives by two phase excitation.

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 16.0	V
Power supply voltage (for control)	V _{CC} max		-0.5 to 6.0	V
Output current	I _O max		1.4	A
Output peak current	I _O peak	t ≤ 10ms	2.5	A
Input voltage	V _{IN} max		-0.5 to V _{CC} +0.5	V
Allowable power dissipation	P _d max	Mounted on a specified board*	1050	mW
Operating temperature	Topr		-30 to +85	°C
Storage temperature	T _{stg}		-55 to +150	°C

* Specified board: 40.0mm × 50.0mm × 0.8mm, 4 Layer 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.

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

Parameter	Symbol	Conditions	Ratings		Unit
Power supply voltage (VM pin)	VM		1.5 to 15.0		V
Power supply voltage (V _{CC} pin)	V _{CC}		2.8 to 5.5		V
Input signal voltage	V _{IN}		0 to V _{CC}		V
Input signal frequency	f max		200	kHz	

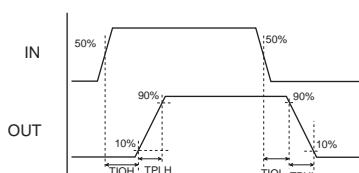
Electrical Characteristics $T_a = 25^\circ\text{C}$, $V_{CC} = 3.0\text{V}$, $VM = 6.0\text{V}$, SGND = PGND = 0V, unless otherwise specified.

Parameter	Symbol	Conditions	Remarks	Ratings			Unit	
				min	typ	max		
Standby load current drain	I _{MO}	EN1=EN2=0V, EXTRA=3V	1			1.0	µA	
Standby control current drain	I _{CO}	EN1=EN2=IN1=IN2=IN3=IN4=0V	2			1.0	µA	
Operating control current drain	I _{C1}	EN=3V, with no load	3		0.85	1.2	mA	
High-level input voltage	V _{IH}	$2.7 \leq V_{CC} \leq 5.5\text{V}$		0.6×V _{CC}		V _{CC}	V	
Low-level input voltage	V _{IL}	$2.7 \leq V_{CC} \leq 5.5\text{V}$		0		0.2×V _{CC}	V	
High-level input current (IN1, IN2, IN3, IN4, EN1, EN2)	I _{IH}	V _{IN} = 3V	4		15	25	µA	
Low-level input current (IN1, IN2, IN3, IN4, EN1, EN2)	I _{IL}	V _{IN} = 0V	4	-1.0			µA	
Pull-down resistance value	R _{DN}	IN1, IN2, IN3, IN4, EN1, EN2	4	100	200	400	kΩ	
High-level input current 2 (IN1, IN2, IN3, IN4, EN1, EN2)	I _{IH2}	V _{IN} = 3V	5			1.0	µA	
Low-level input current 2 (IN1, IN2, IN3, IN4, EN1, EN2)	I _{IL2}	V _{IN} = 0V	5	-25	-15		µA	
Pull-up resistance value	R _{UP}	EXTRA	5	100	200	400	kΩ	
Charge pump voltage	V _G	V _{CC} + VM		8.5	9.0	9.5	V	
Output ON resistance 1	R _{ON1}	Sum of top and bottom sides ON resistance.	6		0.75	1.2	Ω	
Output ON resistance 2	R _{ON2}	Sum of top and bottom sides ON resistance. $V_{CC} = 2.8\text{V}$	6		1.0	1.5	Ω	
Low-voltage detection voltage	V _{CS}	V _{CC} pin voltage is monitored	7	2.15	2.30	2.45	V	
Thermal shutdown temperature	T _{th}	Design guarantee value *	8	150	180	210	°C	
Output block	Turn-on time	T _{PLH}	When no load. Design guarantee value *	9		0.3	0.5	µS
			When no load.	10		100	200	nS
	Turn-off time	T _{PHL}	When no load. Design guarantee value *	9		0.35	0.6	µS
			When no load.	10		100	200	nS

*: Design guarantee value and no measurement is preformed.

Remarks

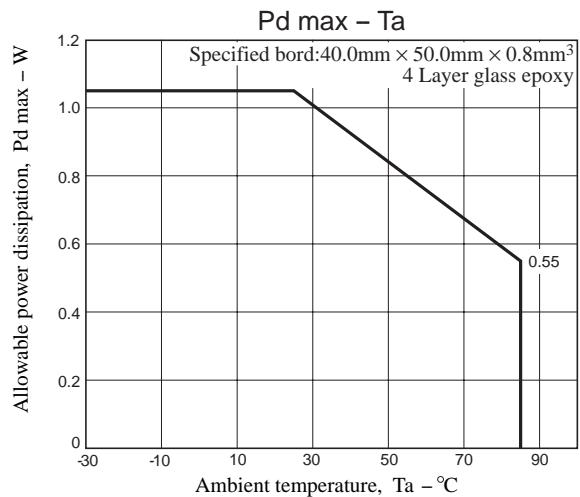
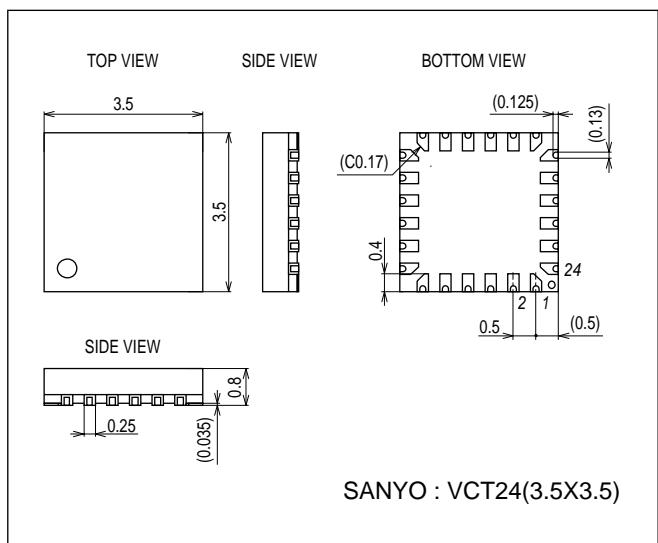
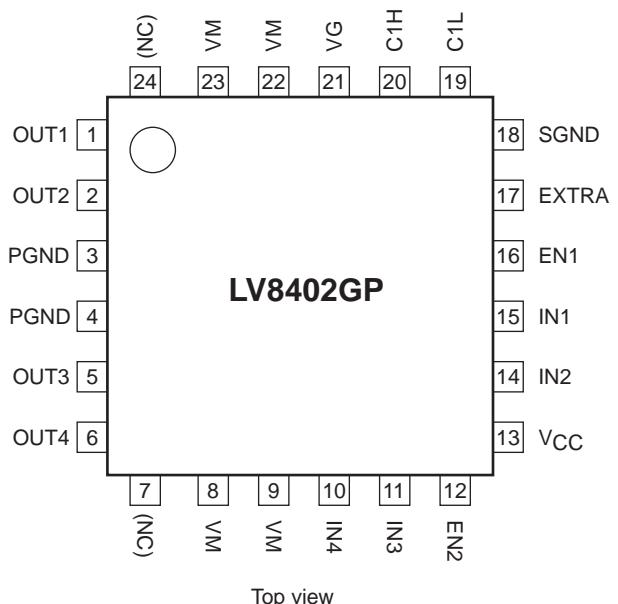
1. Current consumption when output at the VM pin is off.
2. Current consumption at the V_{CC} for standby mode.
3. EN1=3V (IC starts) shows the current consumption of the V_{CC} pin.
4. Pins IN 1, 2, 3, 4, EN1, and EN2 are all pulled down according to resistance.
5. EXTRA pin is pulled up according to resistance.
6. Sum of upper and lower saturation voltages of OUT pin divided by the current.
7. All power transistors are turned off if a low V_{CC} condition is detected.
8. All output transistors are turned off if the thermal protection circuit is activated. They are turned on again as the temperature goes down.
9. Rising time from 10 to 90% and falling time from 90 to 10% are specified.
10. The change of the voltage of the input pin provides for time until the voltage of the terminal OUT changes by 10% at the time of 50% of V_{CC}.



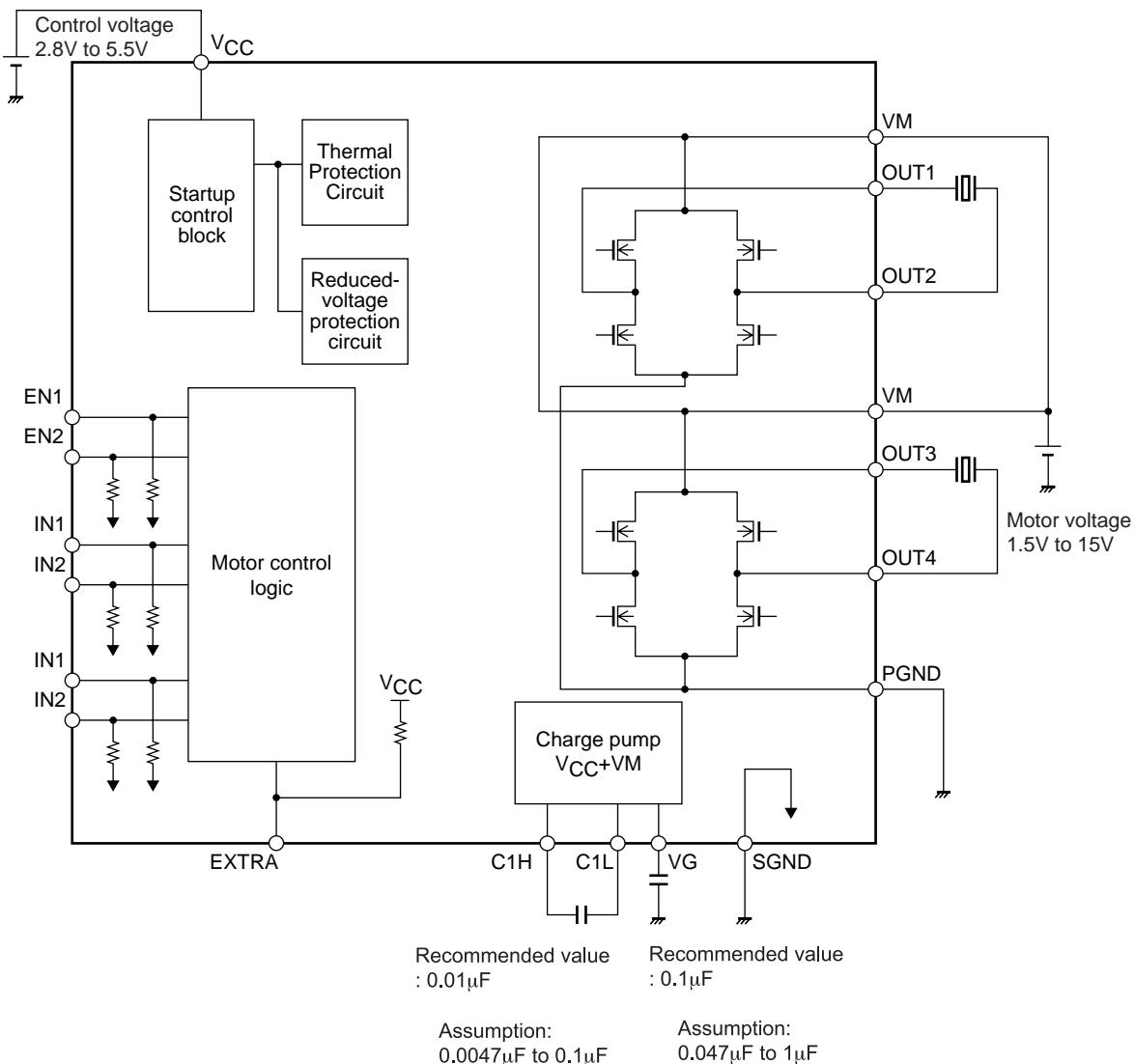
Package Dimensions

unit : mm (typ)

3322A

**Pin Assignment**

Block Diagram



* Connect a kickback absorption capacitor as near as possible to the IC. Coil kickback may cause increase in VM line voltage, and a voltage exceeding the maximum rating may be applied momentarily to the IC, which results in deterioration or damage of the IC

Truth Table

EXTRA	EN1 (EN2)	IN1 (IN3)	IN2 (IN4)	OUT1 (OUT3)	OUT2 (OUT4)	Charge pump	Mode
H	H	H	H	Z	Z	ON	Stand-by
		H	L	L	H		Reverse
		L	H	H	L		Forward
		L	L	L	L		Brake
	L	-	-	L	L	OFF	Stand-by
L	H	H	-	L	H	ON	Reverse
		L	-	H	L		Forward
	L	-	-	L	L		Brake

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

• In the standby mode, current consumption vanishes.

* All power transistors turn off and the motor stops driving when the IC is detected in low voltage or thermal protection mode.

Pin Functions

Pin No.	Pin name	Description	Equivalent circuit
20 21	C1H VG	Step-up capacitor connection pin.	
17	EXTRA	Extra logic pin. (Logic switch for PWM)	
16 12 15 14 11 10	EN1 EN2 IN1 IN2 IN3 IN4	Driver output switching. Logic enable pin. (Pull-down resistor incorporated)	
1 2 5 6	OUT1 OUT2 OUT3 OUT4	Driver output.	
8, 9, 22, 23	VM	Motor block power supply.	
13	VCC	Logic block power supply.	
18	SGND	Control block ground.	
3, 4	PGND	Driver block ground.	

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