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LV8413GP

Bi-CMOS LSI For DSC, and Cell Phone Camera Modules H-Bridge × 2-channel Motor Driver

Overview

The LV8413GP is an H-bridge × 2-channel motor driver IC and is able to control 4 modes of forward, reverse, brake, and standby.

This IC housed in a miniature package is optimum for use in a stepping motor driving system for DSC or a camera module of cell phones.

Features

- Saturation drive H-bridge : 2-channels
- Built-in thermal protection circuit
- Built-in low voltage malfunction prevention circuit
- Incorporates a transistor for driving photosensors

Specifications

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

| Parameter | Symbol | Conditions | Ratings | Unit |
|-----------------------------|--------------|---|-------------|------------------|
| Power supply voltage 1 | V_M max | | 6 | V |
| Power supply voltage 2 | V_{CC} max | | 6 | V |
| Output peak current | I_O peak | Outs 1 to 4, $t \leq 10\text{msec}$, ON-duty $\leq 20\%$ | 600 | mA |
| Output continuous current 1 | I_O max1 | Outs 1 to 4 | 400 | mA |
| Output continuous current 2 | I_O max2 | PI | 15 | mA |
| Allowable power dissipation | P_d max | Mounted on a circuit board* | 0.7 | W |
| Operating temperature | T_{opr} | | -30 to +85 | $^\circ\text{C}$ |
| Storage temperature | T_{stg} | | -55 to +150 | $^\circ\text{C}$ |

* Specified circuit board : 50.0mm × 40.0mm × 0.8mm : glass epoxy four-layer board (2S2P)

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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Recommended Operating Conditions at Ta = 25°C

| Parameter | Symbol | Conditions | Ratings | Unit |
|------------------------------|--------|---------------|--------------|------|
| Power supply voltage range 1 | VM | | 2.5 to 5.5 | V |
| Power supply voltage range 2 | VCC | | 2.5 to 5.5 | V |
| Logic input voltage range | VIN | | 0 to VCC+0.3 | V |
| Input frequency | fIN | IN1 to 4, INA | to 100 | kHz |

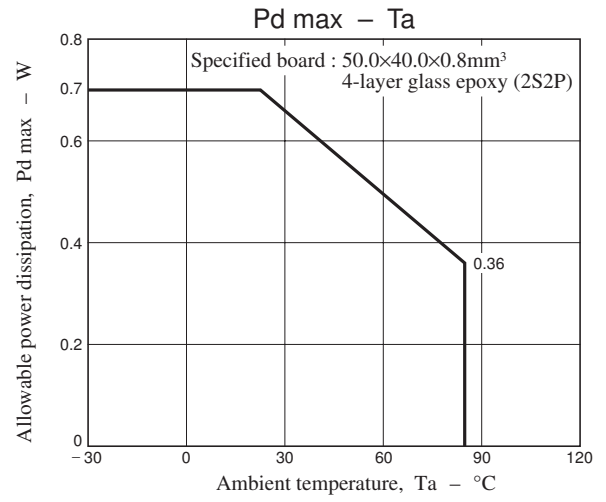
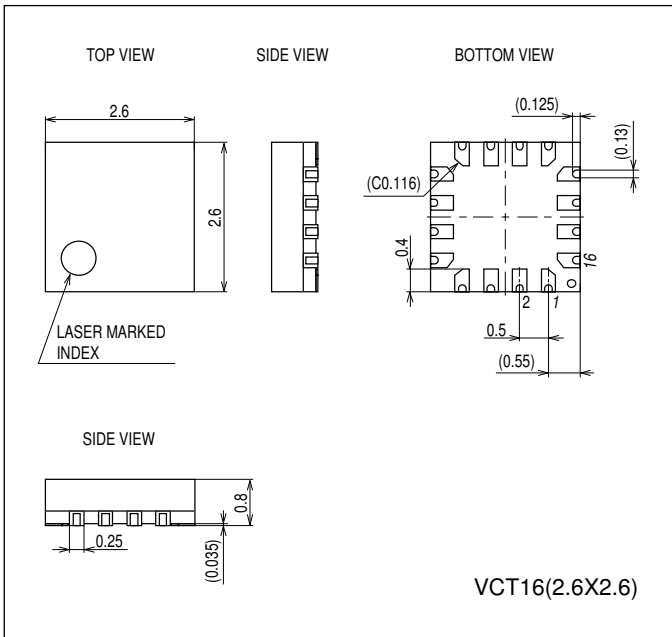
Electrical Characteristics at Ta = 25°C, VM = 5V, VCC = 3.3V, unless otherwise specified.

| Parameter | Symbol | Conditions | Ratings | | | Unit |
|---|--------|---|---------|------|------|------|
| | | | min | typ | max | |
| Standby mode current drain | Istn | IN1 to 4 = "L" | | | 1.0 | μA |
| VM current drain | IM | Any one of IN1 to 4 = "H", with no load | | 70 | 150 | μA |
| VCC current drain | ICC | Any one of IN1 to 4 = "H" | | 0.6 | 1.2 | mA |
| VCC low-voltage cutoff voltage | VthVCC | | 1.85 | 2.10 | 2.35 | V |
| Low-voltage hysteresis voltage | VthHYS | | 100 | 150 | 200 | mV |
| Thermal shutdown temperature | TSD | Design guarantee value * | 160 | 180 | 200 | °C |
| Thermal hysteresis width | ΔTSD | Design guarantee value * | 10 | 30 | 50 | °C |
| OUT1 to 4 | | | | | | |
| Logic pin internal pull-down resistance | Rin | IN1 to 4 | 50 | 100 | 200 | kΩ |
| Logic pin input current | IinL | VIN = 0, IN1 to 4 | | | 1.0 | μA |
| | IinH | VIN = 3.3V, IN1 to 4 | 20 | 33 | 60 | μA |
| Logic input high-level voltage | VinH | IN1 to 4 | 2.5 | | | V |
| Logic input low-level voltage | VinL | IN1 to 4 | | | 1.0 | V |
| Output on-resistance | Ronu | IO = 400mA, upper ON resistance | | 0.5 | 0.8 | Ω |
| | Rond | IO = 400mA, lower ON resistance | | 0.3 | 0.5 | Ω |
| Output leakage current | IOleak | | | | 1 | μA |
| Diode forward voltage | VD | ID = -400mA | | 1.0 | | V |
| PI | | | | | | |
| Logic pin internal pull-down resistance | Rin | INA | 50 | 100 | 200 | kΩ |
| Logic pin input current | IinL | VIN = 0, INA | | | 1.0 | μA |
| | IinH | VIN = 3.3V, INA | 20 | 33 | 50 | μA |
| Logic input high-level voltage | VinH | INA | 2.5 | | | V |
| Logic input low-level voltage | VinL | INA | | | 1.0 | V |
| Output on-resistance | Ron | IO = 10mA | | 4 | 6 | Ω |
| Output leakage current | IOleak | | | | 1 | μA |

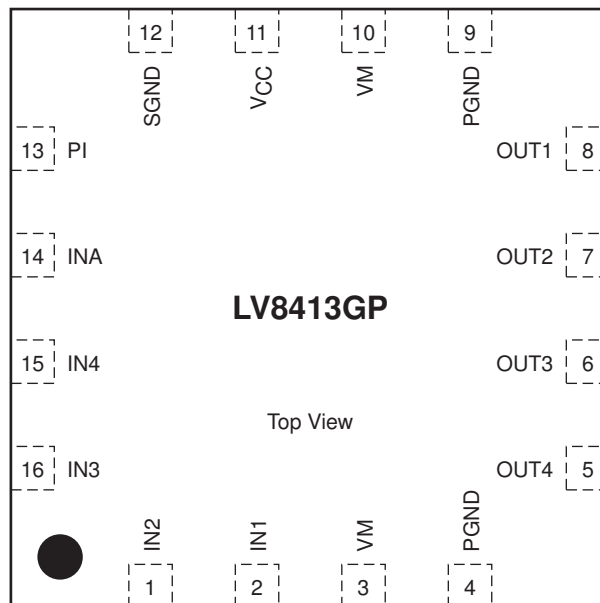
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Package Dimensions

unit : mm (typ)
3318

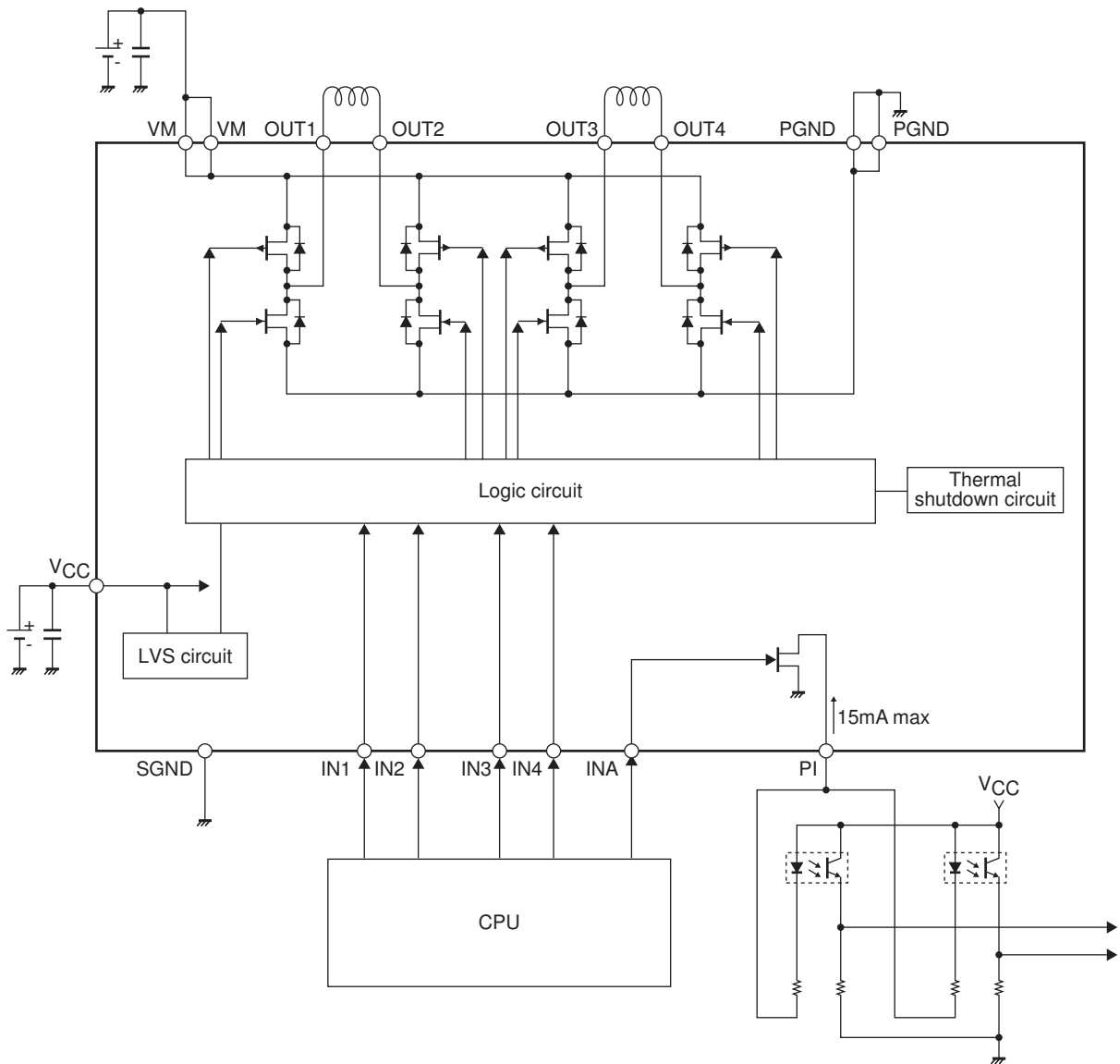


Pin Assignment



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Block Diagram



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Pin Functions

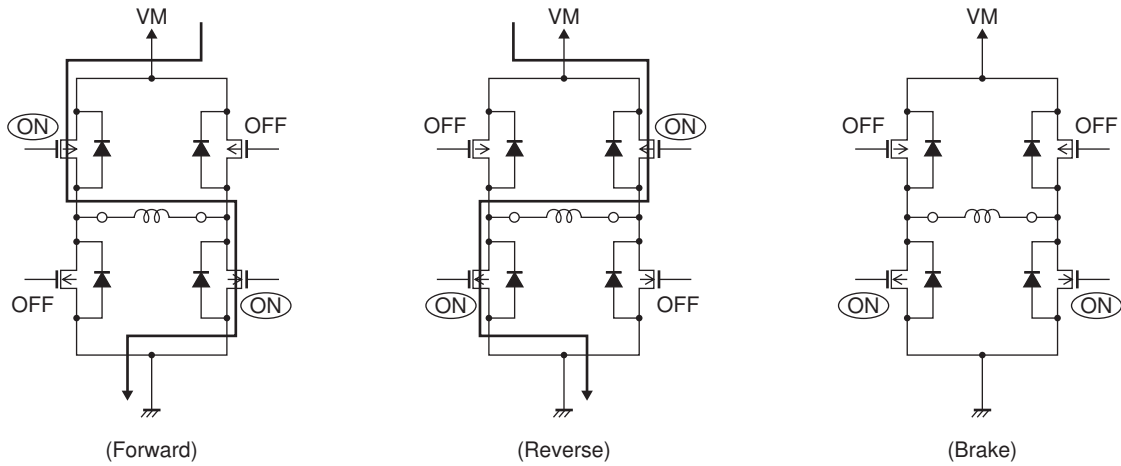
| Pin No. | Pin name | Pin Function | Equivalent Circuit |
|--------------------------|---------------------------------|--|--------------------|
| 2 1 16 15 14 | IN1 IN2 IN3 IN4 INA | Control signal input pin Control signal input pin Control signal input pin Control signal input pin Control signal input pin | |
| 8 7 6 5 | OUT1 OUT2 OUT3 OUT4 | Outpin Outpin Outpin Outpin | |
| 13 | PI | Outpin | |
| 11 | VCC | Logic system power supply connection pin | |
| 3 10 | VM VM | Motor power supply connection pin Motor power supply connection pin | |
| 12 | SGND | Signal ground | |
| 4 9 | PGND PGND | Power ground Power ground | |

Logic input specifications

- Common channels 1 to 2
 ch1 : IN1 to IN2, OUT1 to OUT2
 ch2 : IN3 to IN4, OUT3 to OUT4

| Input | | Output | | Operation mode |
|-------|-----|--------|------|----------------|
| IN1 | IN2 | OUT1 | OUT2 | |
| L | L | OFF | OFF | Standby |
| H | L | H | L | CW (forward) |
| L | H | L | H | CCW (reverse) |
| H | H | L | L | Brake |

- Output stage transistor function



- Photo sensor driving transistor

When thermal shutdown and VCC low-voltage cut circuits are activated, OUT1 through OUT4 are turned OFF under control of the internal circuit. But the output (PI) of photo sensor driving transistor continues operation.

| Input INA | Photo sensor driving PI |
|--------------|----------------------------|
| L | OFF |
| H | ON |

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