Monolithic Digital IC

3-phase sensor less Motor driver



http://onsemi.com

Overview

The LB11685VH is a three-phase full-wave current-linear-drive motor driver IC. It adopts a sensor less control system without the use of a Hall Effect device. For quieter operation, the LB11685VH features a current soft switching circuit and be optimal for driving the cooling fan motors used in refrigerators, etc.

Functions

- Three-phase full-wave linear drive (Hall sensor-less method)
- Built-in three-phase output voltage control circuit
- Motor lock protection detection output
- Built-in thermal shut down circuit

- Built-in current limiter circuit
- Built-in motor lock protection circuit
- FG output made by back EMF
- Beat lock prevention circuit

Specifications

Maximum Ratings at $Ta = 25^{\circ}C$

| Parameter | Symbol | Conditions | Ratings | Unit |
|-----------------------------|---------------------|-----------------------|------------------------------|------|
| Maximum supply voltage | V _{CC} max | | 19 | V |
| Input applied voltage | V _{IN} max | | -0.3 to V _{CC} +0.3 | V |
| Maximum output current | IO max *1 | | 1.2 | Α |
| Allowable power dissipation | Pd max | Mounted on a board *2 | 1.4 | W |
| Operating temperature | Topr | | -40 to 85 | °C |
| Storage temperature | Tstg | | -55 to 150 | °C |
| Junction temperature | Tj max | | 150 | °C |

^{*1:} The IO is a peak value of motor-current.

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.

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.

^{*2:} Specified board: $76.1 \text{mm} \times 114.3 \text{mm} \times 1.6 \text{mm}$, glass epoxy board.

Recommended Operating Conditions at Ta = 25°C

| Parameter | Symbol | Conditions | Ratings | Unit |
|----------------------------|--------------------|------------|-------------|------|
| Recommended Supply voltage | VCC | | 12.0 | V |
| Operating supply voltage | V _{CC} op | | 4.5 to 18.0 | V |

Electrical Characteristics at $Ta = 25^{\circ}C$, $V_{CC} = 5.0V$

| Parameter | Symbol | Conditions | | Ratings | | |
|---|----------------------|---|-------|---------|---------------------|------|
| Faranielei | | | min | typ | max | Unit |
| Supply current | ICC | FC1 = FC2 = 0V | 5 | 10 | 20 | mA |
| Internal regulate voltage | VREG | | 3.0 | 3.3 | 3.6 | V |
| Output voltage (source) | VOSOUR | I _O = 0.8A *3 | | 1.3 | 1.7 | V |
| Output voltage (sink) | VOSINK | I _O = 0.8A *3 | | 0.5 | 1.3 | V |
| Current limiter | VOLIM | | 0.268 | 0.300 | 0.332 | V |
| MCOM pin common-input voltage range | VINCOM | | 0 | | V _{CC} - 2 | V |
| MCOM pin Source current for hysteresis | ICOM+ | MCOM = 7V | 30 | | 80 | μΑ |
| MCOM pin Sink current for hysteresis | ICOM- | MCOM = 7V | 30 | | 80 | μΑ |
| MCOM pin hysteresis current ratio | RTCOM | RTCOM = ICOM+ / ICOM- | 0.6 | | 1.4 | |
| VCO input bias current | lvco | V _{CO} = 2.3V | | | 0.2 | μΑ |
| VCO oscillation minimum frequency | fVCOmin | V_{CO} = 2.1V, CX = 0.015μF Design target *2 | | 930 | | Hz |
| VCO oscillation maximum frequency | f _{VCO} max | V_{CO} = 2.7V, CX = 0.015μF Design target *2 | | 8.6 | | kHz |
| CX charge / discharge current | I _{CX} | V _{CO} = 2.5V, CX = 1.6V | 70 | 100 | 140 | μΑ |
| CX hysteresis voltage | ΔVCX | | 0.35 | 0.55 | 0.75 | |
| C1 (C2) charge current | IC1(2)+ | V _{CO} = 2.5V, C1(2) = 1.3V | 12 | 20 | 28 | μΑ |
| C1 (C2) discharge current | IC1(2)- | V _{CO} = 2.5V, C1(2) = 1.3V | 12 | 20 | 28 | μΑ |
| C1 (C2) charge / discharge current ratio | RTC1(2) | RTC1(2) = IC1(2)+ / IC1(2)- | 0.8 | 1.0 | 1.2 | |
| C1/C2 charge current ratio | RTCCHG | RTCCHG = IC1+ / IC2+ | 0.8 | 1.0 | 1.2 | |
| C1/C2 discharge current ratio | RTCDIS | RTCDIS = IC1- / IC2- | 0.8 | 1.0 | 1.2 | |
| C1 (C2) cramp voltage width | VCW1(2) | | 1.0 | 1.3 | 1.6 | V |
| FG output low level voltage | VFGL | IFG = 3mA | | | 0.5 | V |
| RD output low level voltage | VRDL | IRD = 3mA | | | 0.5 | ٧ |
| Thermal shut down operating temperature *1 | TTSD | Junction temperature Design target *2 | 150 | 180 | | °C |
| Thermal shut down hysteresis temperature *1 | ΔTTSD | Junction temperature Design target *2 | | 15 | | °C |

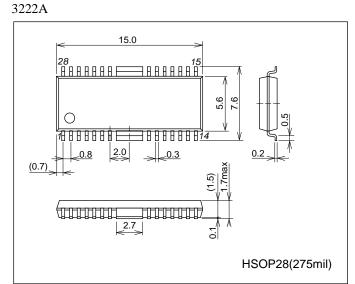
^{*1:} The thermal shut down circuit is built-in for protection from damage of IC. But its operation is out of Topr. Design thermal calculation at normal operation.

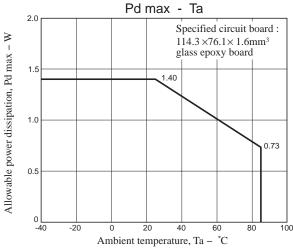
^{*2:} Design target value and no measurement is made.

 $^{^{\}star}3$: The I $_{O}$ is a peak value of motor-current.

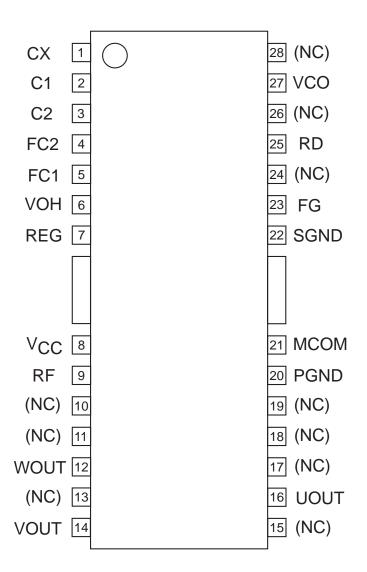
Package Dimensions

unit: mm (typ)

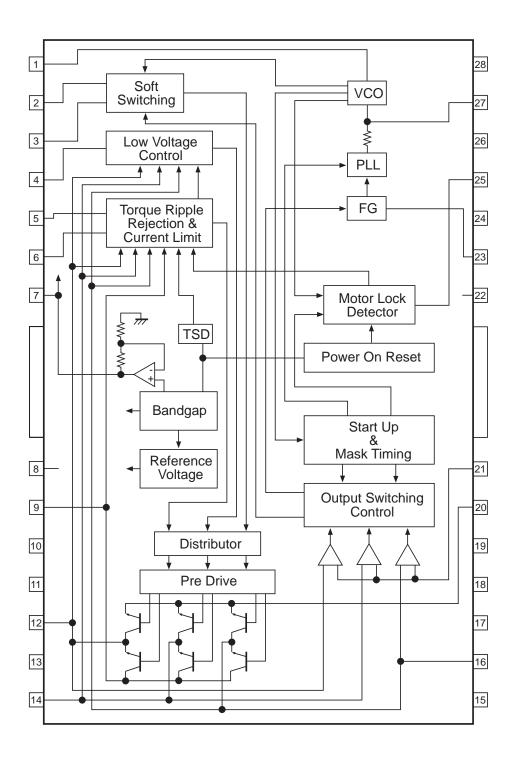




Pin Assignment



Block Diagram



Pin Function

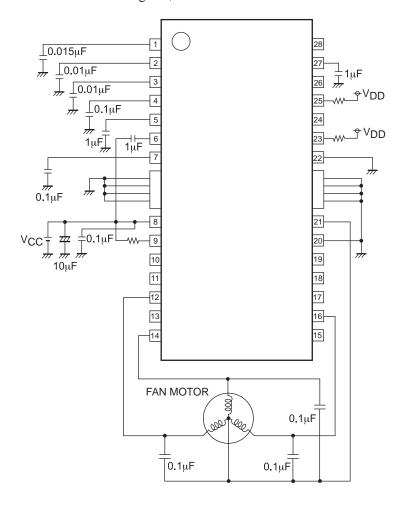
| Pin No. | Pin name | Function | Equivalent circuit |
|---------|------------|--|---|
| 16 | UOUT | Each output pin of three phases. | Equivalent circuit |
| 12 | WOUT | Tagar Para Para Para Para Para Para Para | ☐ Pin No.9 |
| 14 | VOUT | | |
| 20 | PGND RF | GND pin in the output part. This pin is connected to GND. The SGND pin is also connected to GND Pin to detect output current. | Pin No.16,14,12 |
| | | By connecting a resistor between this pin and V_{CC} , the output current is detected as a voltage. The current limiter is operated by this voltage. | Pin No.20 |
| 21 | мсом | Motor coil midpoint input pin. The coil voltage waveform is detected based on this voltage. | Pin No.21 SGND SGND SGND SGND SGND SGND SGND SGND |
| 22 | SGND | Ground pin (except the output part) This pin is connected to GND. The PGND pin is also connected to GND. | |
| 23 | FG | FG out made by back EMF pin. It synchronizes FG out with inverted V-phase. When don't use this function, open this pin. | Pin No.23 No.25 |
| 25 | RD | Motor lock protection detection output pin. Output with L during rotation of motor. Open during lock protection of motor (High-impedance). When don't use this function, open this pin. | SGND |
| 27 | vco | PLL output pin and VCO input pin. To stabilize PLL output, connect a capacitor between this pin and GND. | VREG VCC Pin No.27 VREG VREG VREG SGND VREG VREG SGND |
| 1 | СХ | VCO oscillation output pin. Operation frequency range and minimum frequency are determined by the capacity of the capacitor connected to this pin. | Pin No.1 |

Continue to the next page.

| | from the former page. | _ | |
|---------|-----------------------|--|----------------------|
| Pin No. | Pin name | Function | Equivalent circuit |
| 3 | C1 C2 | Soft switching adjustment pin. The triangular wave from is form formed by connecting a capacitor with this pin. And, the switching of three-phase output is adjusted by the slope. | Pin No.2 SGND SGND |
| 4 | FC2 | Frequency characteristic correction pin 2. To suppress the oscillation of control system closed loop of sink-side, connect a capacitor between this pin and GND. | VREG VCC Pin No.4 |
| 5 | FC1 | Frequency characteristic correction pin 1. To suppress the oscillation of control system closed loop of source-side, connect a capacitor between this pin and GND. | Pin No.5 SGND SGND |
| 6 | VOH | Three-phase output high level output pin. To stabilize the output voltage of this pin, connect a capacitor between this pin and the V _{CC} pin. | Pin No.6 SGND |
| 7 | VREG | DC voltage (3.3V) output pin. Connect a capacitor between this pin and GND for stabilization. | Pin No.7 |
| 19 | VCC | Pin to supply power-supply voltage. To curb the influence of ripple and noise. The voltage should be stabilized. | |

Application Circuit Example

* Each fixed number in the following FIG, is the referential value.



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 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 Opport

AMEYA360 Components Supply Platform

Authorized Distribution Brand:

























Website:

Welcome to visit www.ameya360.com

Contact Us:

Address:

401 Building No.5, JiuGe Business Center, Lane 2301, Yishan Rd Minhang District, Shanghai , China

Sales:

Direct +86 (21) 6401-6692

Email amall@ameya360.com

QQ 800077892

Skype ameyasales1 ameyasales2

Customer Service :

Email service@ameya360.com

Partnership :

Tel +86 (21) 64016692-8333

Email mkt@ameya360.com