

LB11683V — Monolithic Digital IC Three-Phase Sensorless Motor Driver

Overview

The LB11683V is a three-phase full-wave current-linear-drive motor driver IC. It adopts a sensorless control system without the use of a Hall effect device. For quieter operation, the LB11683V features a current soft switching circuit and is optimal for driving the cooling fan motors used in refrigerators, etc.

Functions

- Current linear drive
- Built-in current limiter circuit
- Output stage oversaturation prevention circuit
- Coil counter-electromotive FG output
- Built-in thermal shutdown circuit
- Beat lock prevention circuit
- Lock protection circuit
- Lock detection output

Specifications

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

| Parameter | Symbol | Conditions | Ratings | Unit |
|-----------------------------|---------------|----------------|----------------------|------------------|
| Supply voltage | $V_{CC\ max}$ | | 14.5 | V |
| Output applied voltage | $V_O\ max$ | | 14.5 | V |
| Input applied voltage | $V_I\ max$ | | -0.3 to $V_{CC}+0.3$ | V |
| Output current | $I_O\ max$ | | 1.5 | A |
| Allowable power dissipation | $P_d\ max$ | Independent IC | 0.5 | W |
| Operating temperature | T_{opr} | | -30 to +85 | $^\circ\text{C}$ |
| Storage temperature | T_{stg} | | -55 to +150 | $^\circ\text{C}$ |

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Allowable Operating Conditions at Ta = 25°C

| Parameter | Symbol | Conditions | Ratings | Unit |
|------------------|-----------------|--|-------------|------|
| Supply voltage 1 | V _{CC} | All operating circuits other than internal 5V Reg. | 5.5 to 7.0 | V |
| Supply voltage 2 | V _{CC} | All operating circuits. | 7.0 to 13.8 | V |

Electrical Characteristics at Ta = 25°C, V_{CC} = 12V

| Parameter | Symbol | Conditions | Ratings | | | Unit |
|--|----------------------|---|---------|------|--------------------|------|
| | | | min | typ | max | |
| Supply current | I _{CC} | V _C =V _{CC} V _F C=0V | | 10 | 15 | mA |
| Output saturation voltage 1 | V _O SAT1 | I _O =0.4A, Source+Sink | | 1.4 | 2.0 | V |
| Output saturation voltage 2 | V _O SAT2 | I _O =0.8A, Source+Sink, R _F =0Ω | | 1.8 | 2.6 | V |
| MCOM pin common-phase input voltage range | V _{IC} | | 0 | | V _{CC} -2 | V |
| PCOUT output current 1 | IPCOU | Source side | | -90 | | μA |
| PCOUT output current 2 | IPCOD | Sink side | | 90 | | μA |
| VCOIN input current | IVCOIN | VCOIN=5V | | 0.1 | 0.2 | μA |
| VCO minimum frequency | f _V COMIN | VCOIN=open CX=0.022μF | 330 | 400 | 500 | Hz |
| VCO maximum frequency | f _V COMAX | VCOIN=5V CX=0.022μF | 14.8 | 18.5 | 22.3 | kHz |
| C1, C2 source current ratio | RSOURCE | 1-(I _C 1SOURCE/I _C 2SOURCE) | -12 | | +12 | % |
| C1, C2 sink current ratio | RSINK | 1-(I _C 1SINK/I _C 2SINK) | -12 | | +12 | % |
| C1 source, sink current ratio | RC1 | I _C 1SOURCE/I _C 1SINK | | 50 | | % |
| C2 source, sink current ratio | RC2 | I _C 2SOURCE/I _C 2SINK | | 50 | | % |
| Counter-electromotive FG output ON voltage | VOL | IFGO=1mA | | | 0.4 | V |
| CT pin charge current | ICT1 | Source current | 1.2 | 1.6 | | μA |
| CT pin discharge current | ICT2 | Sink current | 50 | 77 | | nA |
| Lock protection detection voltage | VRD1 | | 2.3 | 2.45 | 2.6 | V |
| Lock protection reset voltage | VRD2 | | 1.13 | 1.26 | 1.39 | V |
| RD pin leak current | IRDLEAK | | | | 10 | μA |
| RD pin output L _O voltage | VRDL | I _O =1mA | | 100 | 400 | mV |
| Current limiter setting voltage | | | 0.45 | 0.5 | 0.55 | V |
| Thermal shutdown operating temperature | TTSD | Design target * | 150 | 180 | 210 | °C |
| Thermal shutdown hysteresis | ΔTTSD | Design target * | | 15 | | °C |

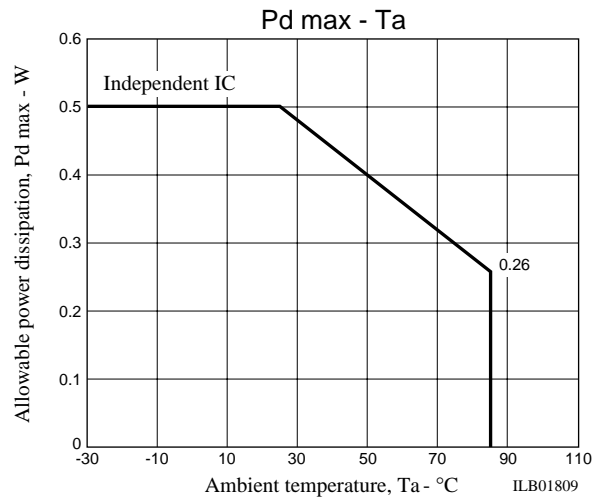
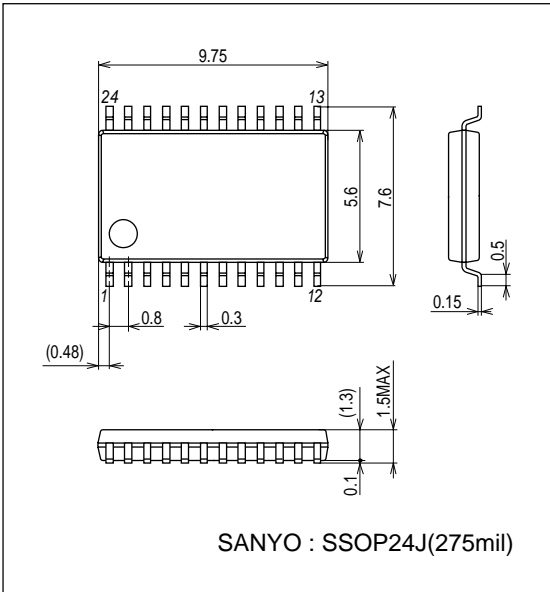
*: Design target value and no measurement is made.

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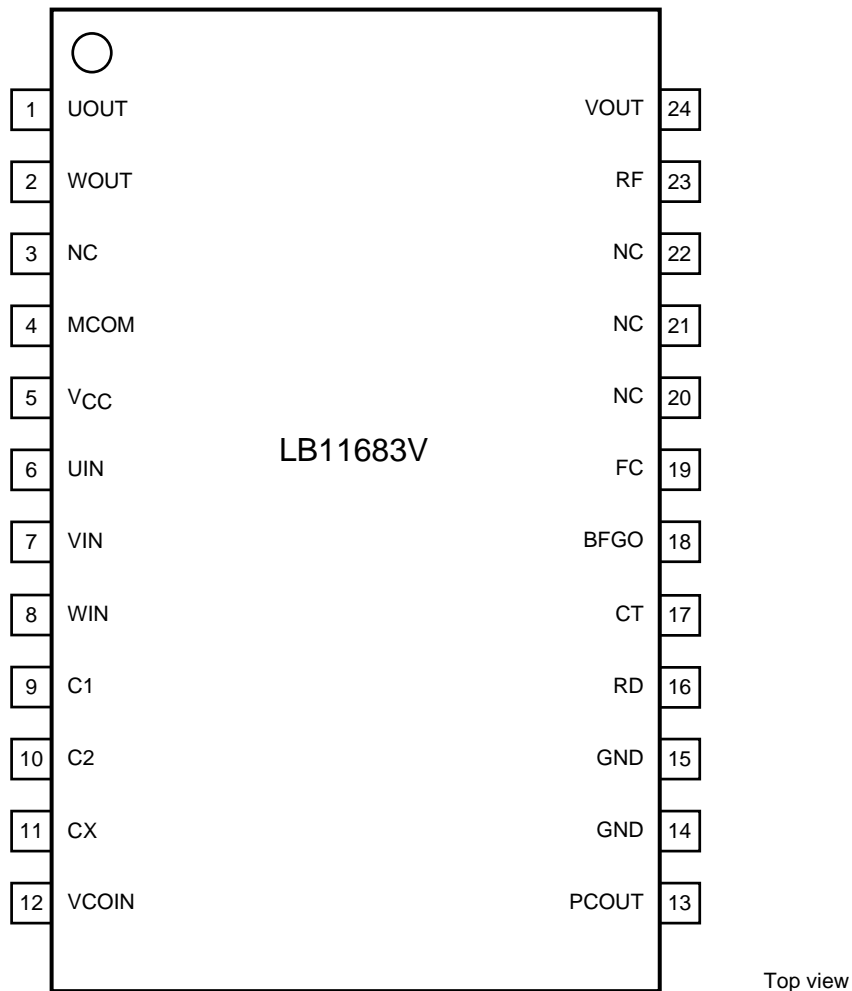
Package Dimensions

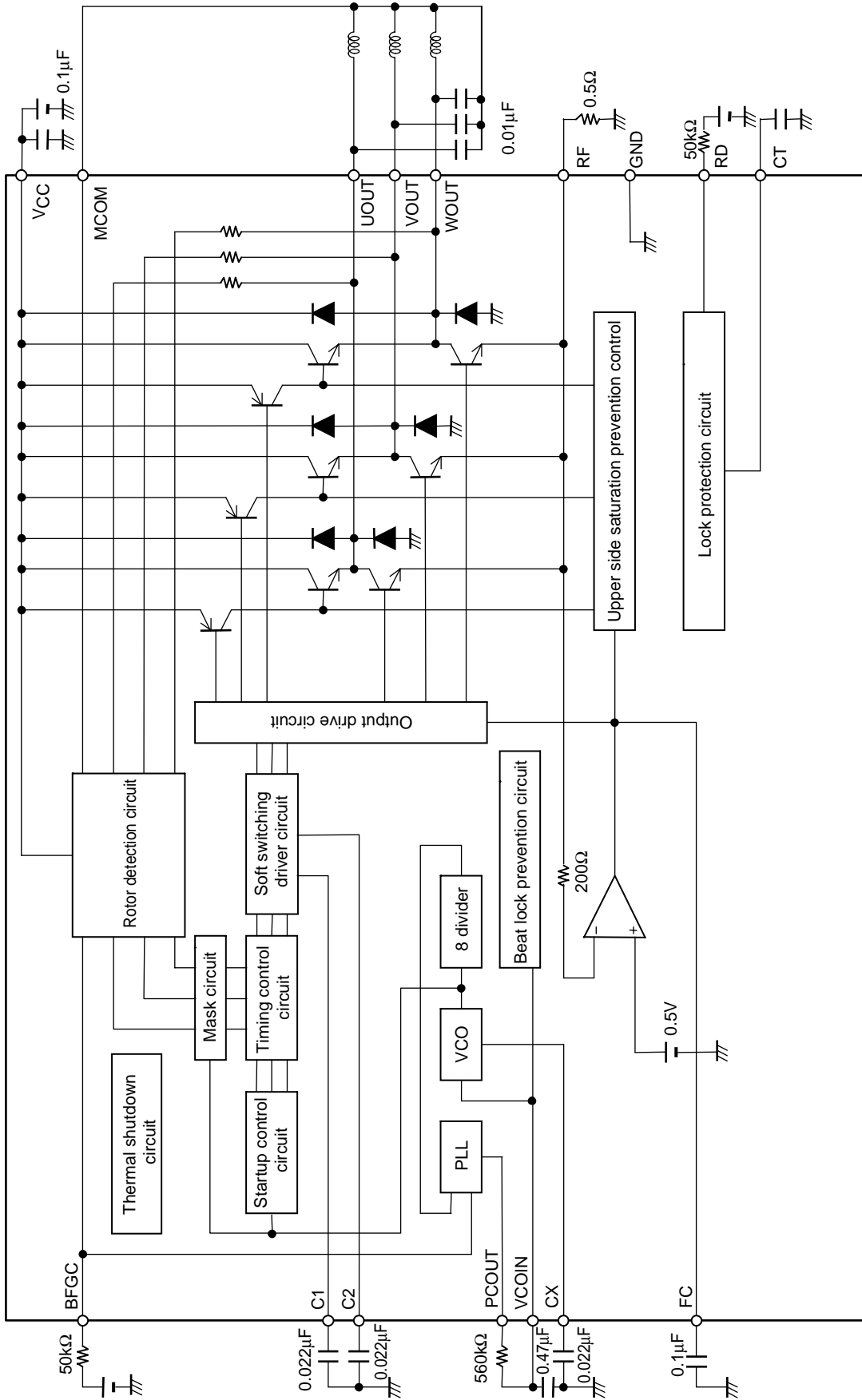
unit : mm (typ)

3315



Pin Assignment





ILB01810

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| Pin No. | Symbol | Pin Voltage | Equivalent Circuit Diagram | Description |
|---------|--------|-------------|----------------------------|---|
| 24 | UOUT | | | 3-phase motor driver output |
| 1 | VOUT | | | <p>Minimum potential of 3-phase motor driver output transistor. Constant current control is made through detection of this voltage. The current limiter also functions by detecting this potential.</p> |
| 2 | WOUT | | | |
| 23 | RF | | | |
| 5 | VCC | 8 to 13.8V | | Power supply |
| 4 | MCOM | | | Motor coil neutral point input pin. The coil voltage waveform is detected with reference to this voltage. |
| 6 | UIN | | | Coil waveform detection comparator input pin. This pin is connected to each phase output through the internal 10kΩ resistor. |
| 7 | VIN | | | |
| 8 | WIN | | | |
| 9 | C1 | | | Triangular wave generating capacitor connection pin. This triangular wave performs soft-switching of the coil output waveforms. |
| 10 | C2 | | | |
| 11 | CX | | | In the VCO circuit, the operation frequency range and minimum operation frequency are determined by means of the capacitor value connected this pin and ground. |
| 12 | VCOIN | | | VCO circuit voltage input pin. The PCOUT pin voltage is input via CR filter. |

Continued on next page.

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| Pin No. | Symbol | Pin Voltage | Equivalent Circuit Diagram | Description |
|----------|--------|-------------|----------------------------|---|
| 13 | PCOUT | | | VCO circuit PLL output |
| 14 15 | GND | | | Ground for all other than the output transistor |
| 18 | BFGO | | | Motor counter-electromotive voltage detection FG output (single-phase only). Open collector output |
| 19 | FC | | | Frequency characteristics compensation pin. Insertion of a capacitor between this pin and ground stops oscillation of the closed loop of current control system. |
| 16 | RD | | | Lock detection output. When motor is running: low-level When motor is locked: high-level Open collector output |
| 17 | CT | | | Lock protection ON/OFF time setting capacitor connection pin. The capacitor connected between this pin and ground determines the driver ON/OFF time when the motor is locked. |

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