

**LB1684****3-Phase DD Motor Driver****Overview**

The LB1684 is a 3-phase DD motor driver IC ideally suited for use in low-supply VCR capstan motor drive, drum motor drive, and floppy disk motor drive applications.

Features

- Designed for 5V-supply control system.
- Voltage-control system/current-control system available.
- Speed control available.
- Bidirectional control available.
- 20V/1.5A rating.

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

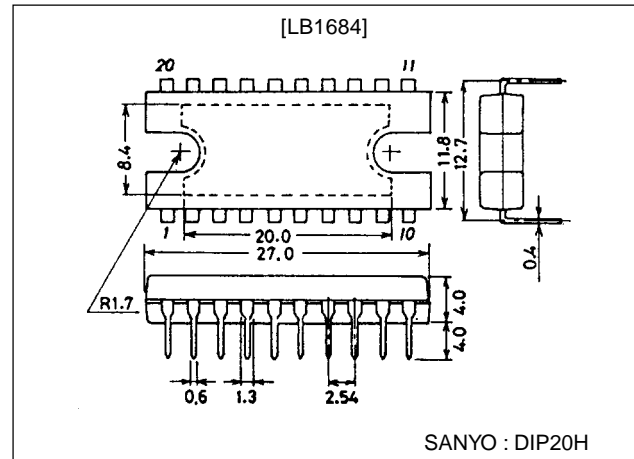
| Parameter | Symbol | Conditions | Ratings | Unit |
|-----------------------------|-------------------|------------|-------------|------------------|
| Maximum supply voltage | V_{CC1} | | 22 | V |
| | V_{CC2} | | 7 | V |
| Output current | I_O | | 1.5 | A |
| Allowable power dissipation | $P_d \text{ max}$ | | 2.2 | W |
| Operating temperature | T_{opr} | | -20 to +75 | $^\circ\text{C}$ |
| Storage temperature | T_{stg} | | -55 to +125 | $^\circ\text{C}$ |

Allowable Operating Conditions at $T_a = 25^\circ\text{C}$

| Parameter | Symbol | Conditions | Ratings | Unit |
|----------------|-----------|------------|------------|------|
| Supply voltage | V_{CC1} | | 7.0 to 2.0 | V |
| | V_{CC2} | | 4.3 to 6.3 | V |

Package Dimensions

unit:mm

3037A-DIP20H

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SANYO Electric Co., Ltd. Semiconductor Business Headquarters

TOKYO OFFICE Tokyo Bldg., 1-10, 1 Chome, Ueno, Taito-ku, TOKYO, 110-8534 JAPAN

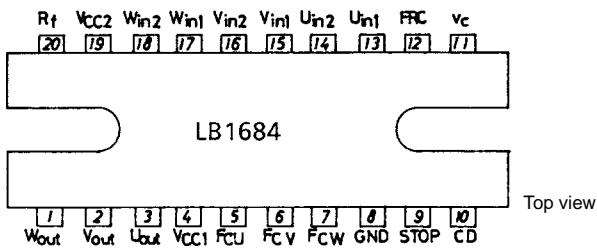
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LB1684

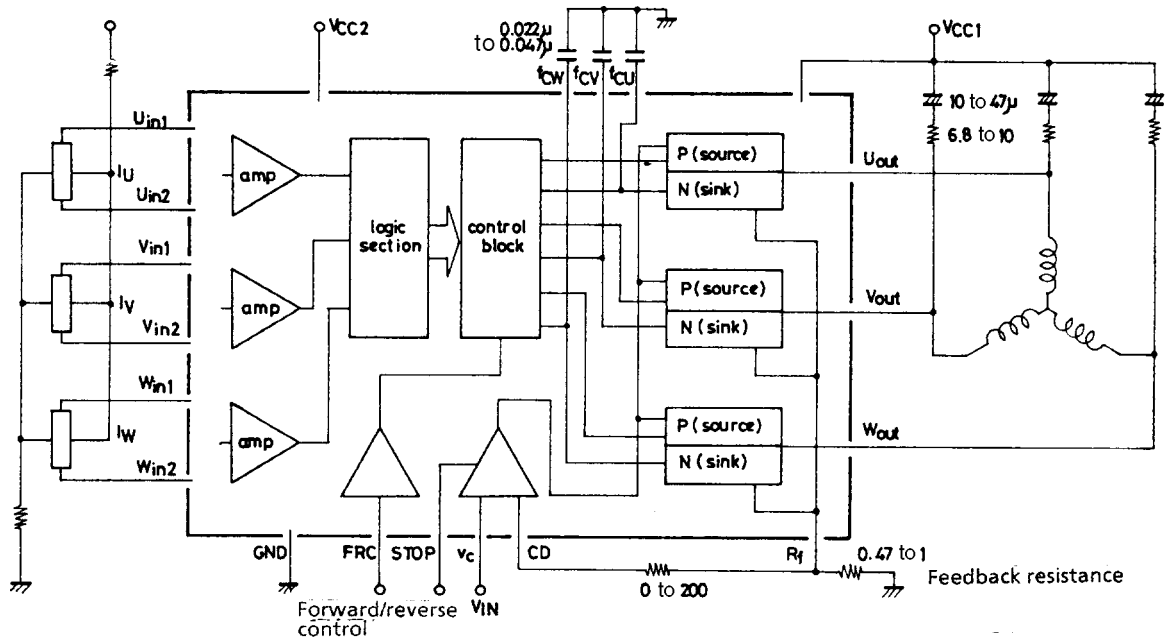
Electrical Characteristics at $T_a = 25^\circ\text{C}$, $V_{CC1}=12\text{V}$, $V_{CC2}=5.0\text{V}$

| Parameter | Symbol | Conditions | Ratings | | | Unit |
|--|----------------------|---|---------|------|---------------|---------|
| | | | min | typ | max | |
| Supply current | $I_{CC}(\text{off})$ | $V_C=0\text{V}$, $I_{CC1}+I_{CC2}$ | | 13 | 18 | mA |
| | $I_{CC}(\text{dri})$ | $V_C=4\text{V}$, I_{CC2} | | 20 | 40 | mA |
| Output saturation voltage | $V_O(\text{sat})1$ | $I_{OUT}=0.58\text{A}$ sink+source | | 1.4 | 2.1 | V |
| | $V_O(\text{sat})2$ | $I_{OUT}=1\text{A}$ sink+source | | 2.0 | 3.5 | V |
| Common-mode input voltage range | | | 1.3 | | $V_{CC2}-1.3$ | V |
| Motor forward rotation input voltage range | | | 2.0 | | V_{CC2} | V |
| Motor reverse rotation input voltage range | | | 0 | | 0.3 | V |
| Interphase current variation | | Driver stage | -25 | 0 | +25 | % |
| | | Output stage | -25 | 0 | +25 | % |
| Speed control voltage (OFF) | V_C1 | $R_f=0$, $R_S=0$, FC pin \rightarrow GND current $5\mu\text{A}$ | | | 2.1 | V |
| Speed control voltage (ON) | V_C2 | $R_f=0$, $R_S=0$, FC pin \rightarrow GND current 0.5mA | 2.38 | | 2.58 | V |
| | V_C3 | $R_f=1\Omega$, $R_S=100\Omega$, $V_{Rf}=100\text{mV}$ | | 2.7 | | V |
| Closed-Loop voltage gain | | $R_f=1\Omega$, $R_S=100\Omega$, $I_L=100\text{mA}$ | | 0.44 | | A/V |
| Input sensitivity | | Hall input | | 20 | | mV peak |

Pin Assignment



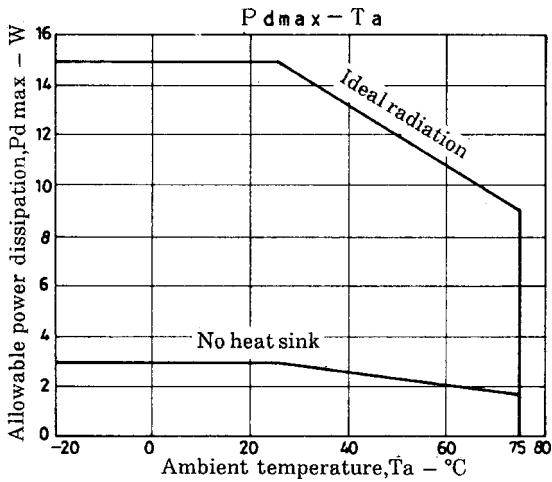
Equivalent Circuit Block Diagram



Unit (resistance: Ω , capacitance: F)

Truth Table

| | Source Sink | Input | | | Forward/Reverse Control |
|---|-------------------|-------|---|---|-------------------------|
| | | U | V | W | F/RC |
| 1 | W phase → V phase | H | H | L | L |
| | V phase → W phase | | | | H |
| 2 | W phase → U phase | H | L | L | L |
| | U phase → W phase | | | | H |
| 3 | V phase → W phase | L | L | H | L |
| | W phase → V phase | | | | H |
| 4 | U phase → V phase | L | H | L | L |
| | V phase → U phase | | | | H |
| 5 | V phase → U phase | H | L | H | L |
| | U phase → V phase | | | | H |
| 6 | U phase → W phase | L | H | H | L |
| | W phase → U phase | | | | H |



Pin Description

| Pin name | Pin No. | Description |
|--|----------------------------|--|
| U_{IN1}, U_{IN2} V_{IN1}, V_{IN2} W_{IN1}, W_{IN2} | 13, 14 15, 16 17, 18 | U phase Hall element input pin. High of logic : $V_{IN1} > V_{IN2}$ V phase Hall element input pin. High of logic : $V_{IN1} > V_{IN2}$ W phase Hall element input pin. High of logic : $V_{IN1} > V_{IN2}$ |
| U_{OUT} V_{OUT} W_{OUT} | 3 2 1 | U phase output pin V phase output pin W phase output pin |
| V_{CC1} | 4 | Power supply pin for applying output |
| V_{CC2} | 19 | Power supply pin for applying voltage to each section other than output section. The control point of control voltage is at approximately 1/2 of this voltage. This voltage must be stabilized to be free from ripple, noise, etc. |
| R_f | 20 | Output current detect pin. By connecting R_f across this pin and GND pin, output current is detected as voltage. |
| C_D | 10 | Pin for fetching current (voltage) detected with R_f . By connecting a resistor across C_D pin and R_f pin, speed control start voltage can be fine-adjusted. |
| STOP | 9 | Overcurrent protection pin. Voltage being lower than that on C_D pin is taken to be identical to overcurrent flow, causing output to be cut off. For example, if STOP pin is set to 1.5V for $R_f=1\Omega$, approximately 1.5A or more flows at output, causing output to be cut off. |
| FCU FCV FCW | 5 6 7 | Ferquency characteristic compensation pin. Closed-loop oscillation in current-controlled system (including motor, F-V converter) is stopped. |
| V_C | 11 | Speed/phase control pin. Control starts at approximately 1/2 of V_{CC2} . Control is of current-controlled type that controls output current. For $R_f=1\Omega$, LB1684 closed-loop has $g_m=0.44A/V$ typ, which can be adjusted by varying R_f . |
| GND | 8 | GND for other than output. Minimum potential of current transistor is at R_f pin. |
| F/R | 12 | Forward/reverse control pin. By setting this pin to high (more than 2.0V)/low (less than 0.3V), truth value is changed to perform forward/reverse rotation. |

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