Monolithic Digital IC

**SANYO**

No. 4954

# LB1674M

## Brushless, Sensorless Motor Driver

## Overview

The LB1674M is a motor driver IC which is ideal for minicassette player, headphone stereo, and microcassette player applications.

## Functions and Features

- Brushless, sensorless motor drive (3-phase unipole drive)
- Forward/Reverse direction
- Speed control function built-in (V-servo)
- Reference voltage built-in (0.5V)
- Soft switching drive

## Performance Characteristics

### Pd max — Ta
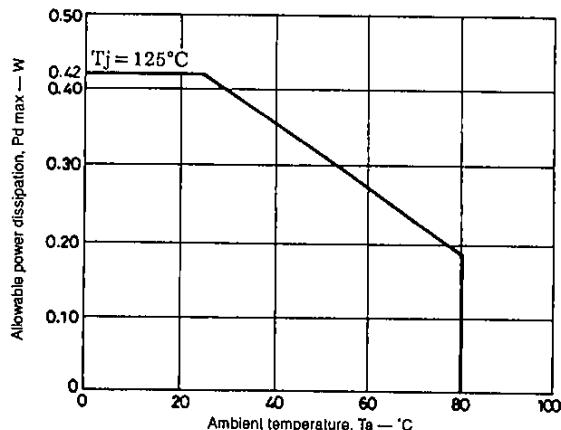


## Package Dimensions

Unit: mm

**3112-MFP24S**
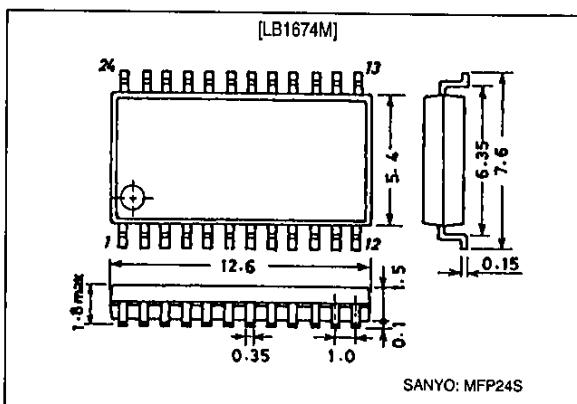
## Specifications

### Absolute Maximum Ratings at Ta = 25°C

| Parameter | Symbol | Conditions | Ratings | Unit |
|---|---|---|---|---|
| Maximum supply voltage | $V_{CC}$ max | | 5 | V |
| Output transistor blocking voltage | $V_O$ (sus) | | 10 | V |
| Maximum output current | Im max | | 0.6 | A |
| Allowable power dissipation | Pd max | Tj = 125°C | 0.42 | W |
| Operating temperature | Topr | | 0 to 80 | °C |
| Storage temperature | Tstg | | −40 to +125 | °C |

### Allowable Operating Ranges at Ta = 25°C

| Parameter | Symbol | Conditions | Ratings | Unit |
|---|---|---|---|---|
| Supply voltage | $V_{CC}$ | | 1.0 to 3.5 | V |

### Electrical Characteristics at Ta = 25°C, $V_{CC}$ = 1.5V, specified test circuit

| Parameter | Symbol | Conditions | Ratings min | Ratings typ | Ratings max | Unit |
|---|---|---|---|---|---|---|
| Supply current | $I_{CC}$ | START = HIGH | – | 6.5 | 10 | mA |
| | | START = LOW | – | 0 | 10 | μA |
| Reference voltage | Vref | | 0.47 | 0.50 | 0.53 | V |
| Voltage characteristic of reference voltage | $\frac{\Delta Vref}{Vref} \times \frac{1}{\Delta V_{CC}}$ | $V_{CC}$ = 1.0 to 3.5V | – | 1 | 1.5 | %/V |
| Load characteristic of reference voltage | $\frac{\Delta Vref}{\Delta Iref}$ | Iref = 0 to −50μA | −0.2 | −0.06 | – | mV/μA |
| Temperature characteristic of reference voltage | $\frac{\Delta Vref}{Vref} \times \frac{1}{\Delta Ta}$ | Ta = 0 to 80°C | – | 0.01 | – | %/°C |
| Speed signal detector accuracy | Vsp | $V_{IN}$ = 750mV | 140 | 155 | 170 | mV |
| Speed signal interphase error | | | −5 | – | +5 | % |
| Voltage characteristic of speed signal | $\frac{\Delta Vsp}{Vsp} \times \frac{1}{\Delta V_{CC}}$ | $V_{CC}$ = 1.0 to 3.5V | – | 2 | 3 | %/V |
| Temperature characteristic of speed signal | $\frac{\Delta Vsp}{Vsp} \times \frac{1}{\Delta Ta}$ | $V_{IN}$ = 0.75V, Ta = 0 to 80°C | – | 0.05 | – | %/°C |
| Current detector sensitivity | $V_{RI}$ | $V_{IN}$1 = 0.3V, $V_{IN}$2 = 1.0V, RI = 330Ω | 70 | 85 | 100 | mV |
| Current detection ratio | $K_I$ | $V_{IN}$1 = 0.3V, $V_{IN}$2 = 1 to 1.3V | 0.17 | 0.22 | 0.27 | |
| Start pulse cycle time | $T_S$ | $C_S$ = 0.1μF | – | 32 | – | ms |
| COM⊖ pull-in current | $I_{COM\ominus}$ | | 25 | 35 | 45 | μA |
| Output saturation voltage | Vsat | $V_{CC}$ = 1.0V, Im = 0.3A | – | 0.15 | 0.25 | V |
| HIGH-level logic input voltage | $V_H$ | | 0.9 | – | – | V |
| LOW-level logic input voltage | $V_L$ | | – | – | 0.3 | V |
| TC pin pull-in current | $I_{TC}$ | | 35 | 50 | 65 | μA |

## Block Diagram
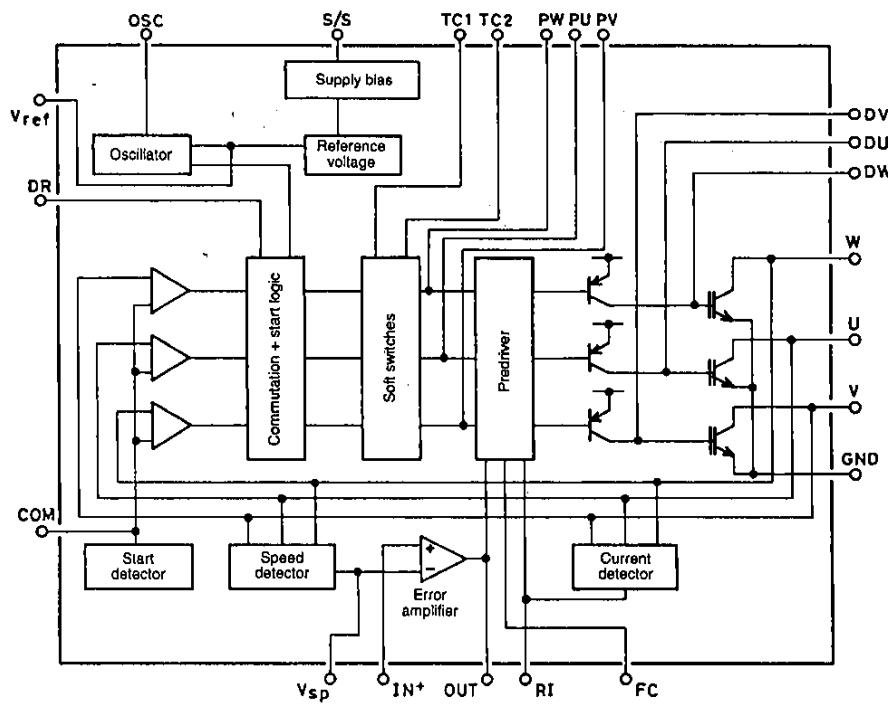


## Pin Functions

| Number | Name | Equivalent circuit[1] | Function |
|--------|------|----------------------|----------|
| 1<br>3<br>23 | V<br>W<br>U |  | Motor coil connection pins |
| 2<br>22<br>24 | DW<br>DU<br>DV | | Power transistor base connections |
| 4 | GND | | Common power ground and signal ground |
| 5 | OSC |  | Start pulse cycle time set pin |

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| Number | Name | Equivalent circuit[1] | Function |
|---|---|---|---|
| 6 | COM⊖ |  | Start waveform detector circuit offset set pin |
| 7 | DR |  | Rotation direction switching control pin (forward when LOW) |
| 8 | Vref |  | Reference voltage pin (0.5V) |
| 9 | START |  | Start/Stop pin. Active HIGH |
| 10 | Vsp |  | Speed signal (motor induced voltage) detector |
| 11 | IN⁺ |  | Speed signal error amplifier reference input pin |
| 12 | OUT |  | Speed signal error amplifier output pin. Motor current feedback control. |

| Number | Name | Equivalent circuit[1] | Function |
|--------|------|----------------------|----------|
| 13 | RI | | Motor current detector pin |
| 14 | TC1 | | Motor current rising/falling slope set pin (for soft switching operation) |
| 15 | TC2 | | Motor current rising/falling slope set pin (for soft switching operation) |
| 16 17 18 | PW PU PV | | Current waveform generator. These pins are for measuring the internal operation. Always left open for normal use. |
| 19 | FC | | Noise and abnormal oscillation stop pin |
| 20 | V$_{CC}$ | | Supply pin |
| 21 | GND | | Common power ground and signal ground |
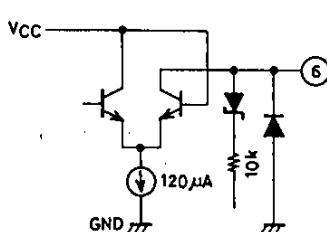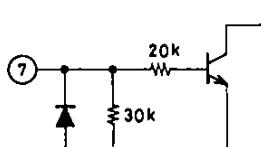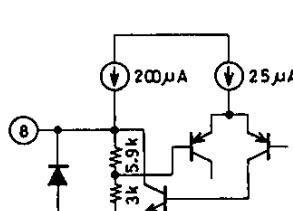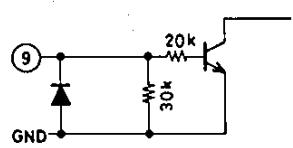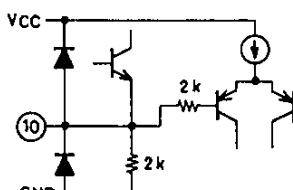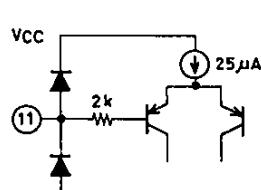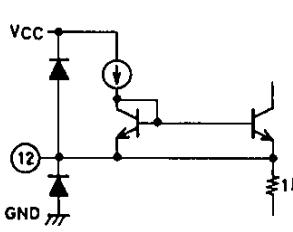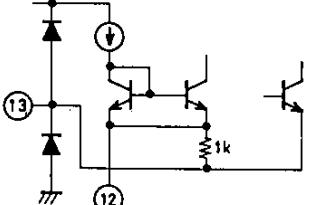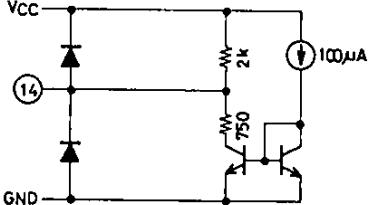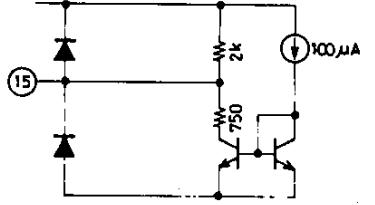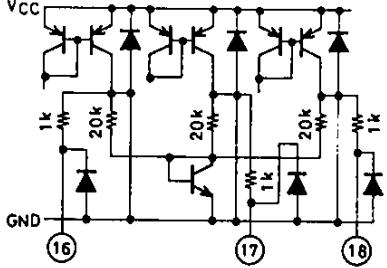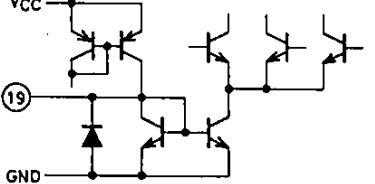
1. Unit (resistance: $\Omega$)

## Pin Assignment



Top pins (left to right): 24 DV, 23 U, 22 DU, 21 GND, 20 VCC, 19 FC, 18 PV, 17 PU, 16 PW, 15 TC2, 14 TC1, 13 RI

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Bottom pins (left to right): 1 V, 2 DW, 3 W, 4 GND, 5 OSC, 6 COM, 7 DR, 8 VREF, 9 START, 10 VSP, 11 IN+, 12 OUT

(Top view)
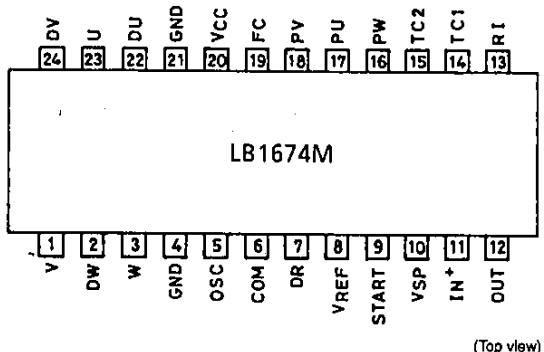
## Sample Peripheral Circuit (V$_{CC}$ = 1.5V)
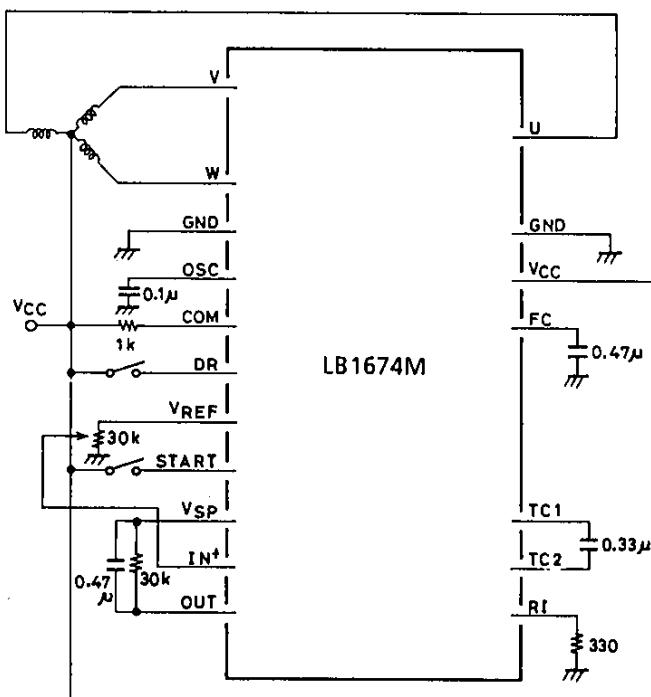


Pins PU, PV and PW are for internal measurement.

Unit (resistance: Ω, capacitance: F)

This catalog provides information as of May, 1995. Specifications and information herein are subject to change without notice.