



# LB1673M

## 3-Phase Brushless, Sensorless Motor Driver

### Applications

Rotational control of brushless motors for use in audio applications such as headphone stereos, micro-cassette recorders, mini-cassette recorders.

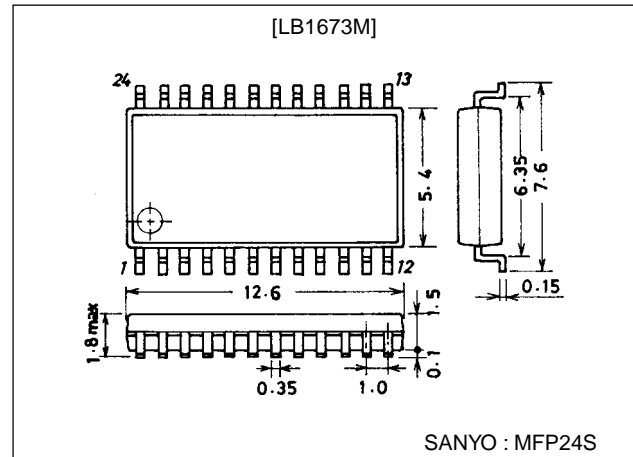
### Function and Features

- Brushless, sensorless motor drive (3-phase half-wave drive).
- Bidirectional motor drive.
- On-chip speed control function (V servo type).
- On-chip reference voltage.
- On-chip one comparator (PNP input, NPN open collector output).

### Package Dimensions

unit:mm

#### 3112-MFP24S



### Specifications

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

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V <sub>CC</sub> max		5	V
Output Transistor Breakdown voltage	V <sub>SUS</sub> max		10	V
Output current	I <sub>M</sub>		1	A
Allowable power dissipation	P <sub>d</sub> max		0.58	W
Operating temperature	T <sub>opr</sub>		0 to +80	°C
Storage temperature	T <sub>stg</sub>		-40 to +125	°C

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

Parameter	Symbol	Conditions	Ratings	Unit
Supply voltage	V <sub>CC</sub>		1.0 to 3.5	V

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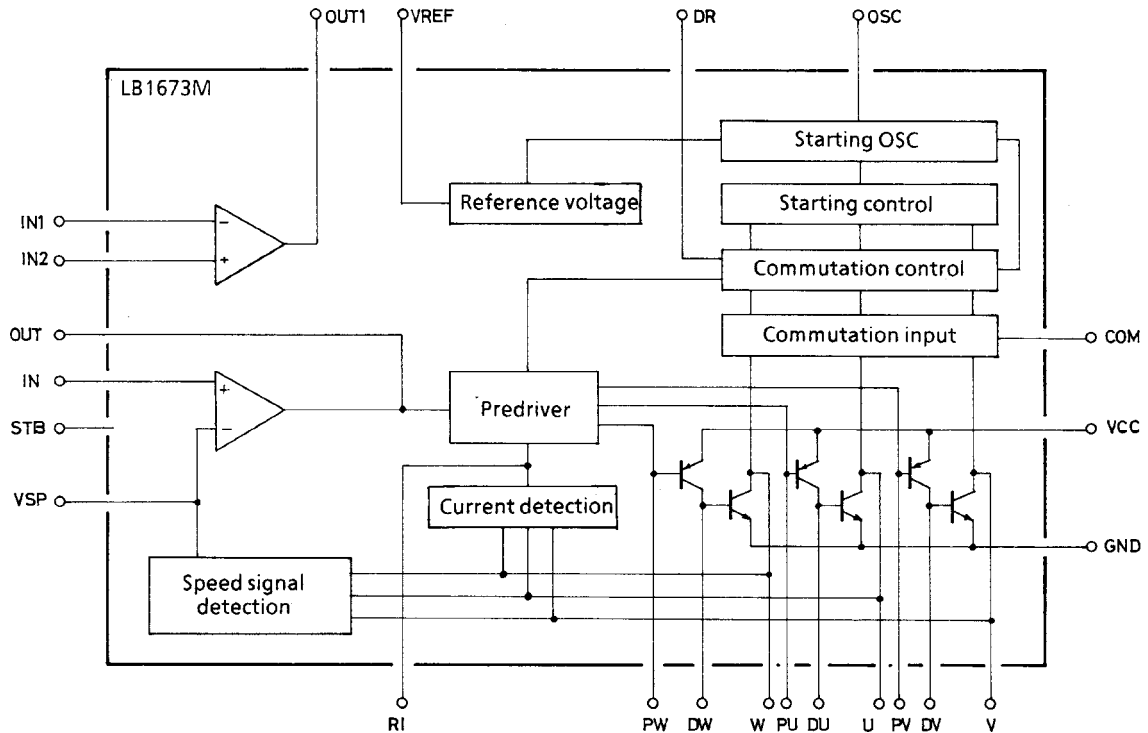
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## Electrical Characteristics at Ta = 25°C

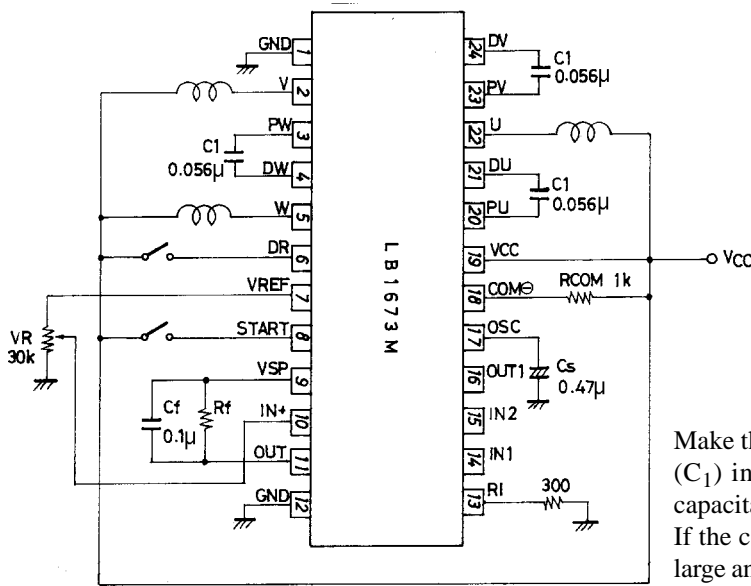
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Supply current 1	$I_{CC(L)}$	START pin low		0	10	mA
Supply current 2	$I_{CC(H)}$	START pin high		4.8	10	$\mu$ A
Reference voltage	Vref		0.49	0.52	0.55	V
Voltage characteristic of reference voltage	$\frac{\Delta V_{ref}}{V_{ref}/\Delta V_{CC}}$	$V_{CC}=1$ to 3.5V		0.3	1.0	%/V
Load characterisric of reference voltage	$\frac{\Delta V_{ref}}{\Delta I_{ref}}$	$I_{ref}=0$ to $-60\mu$ A		-0.03		mV/ $\mu$ A
Temperature characteristic of reference voltage	$\frac{\Delta V_{ref}}{V_{ref}/\Delta T_a}$	$T_a=0$ to $+80^\circ$ C		0		%/°C
Speed signal detection accuracy	Vsp	$V_{IN}=500$ mV	135	145	155	mV
Speed signal correlation error			-5		5	%
Voltage characteristic of speed signal	$\frac{\Delta V_{sp}}{V_{sp}/\Delta V_{CC}}$	$V_{CC}=1$ to 3.5V		0.2	1.0	%/V
Temperature characteristic of speed signal	$\frac{\Delta V_{sp}}{V_{sp}/\Delta T_a}$	$T_a=0$ to $+60^\circ$ C		0		%/°C
Current detection accuracy	$V_{RI}$	$V_{IN1}=0.3$ V, $V_{IN2}=1$ V	50	65	80	mV
Current detection ratio	$K_I$	$V_{IN2}=1$ to 1.3V	0.14	0.17	0.25	
Pin OSC flow-out current	$I_{OSC}$	Measured as pin OSC is 0.4V	2.6	3.8	5.0	$\mu$ A
Starting pulse width	$T_{OSC}$	$C_S=0.47\mu$ F		60		ms
COM pull-in current	$V_{COM}$ $\ominus$	Short $V_{CC}$ with COM	20	30	40	$\mu$ A
Output saturation voltage	Vsat	$V_{CC}=1$ V, $I_m=0.2$ A		0.09	0.25	V
Logic input high-level voltage	$V_H$		0.9			V
Logic input low-level voltage	$V_L$				0.3	V
Comparator offset voltage	$V_{OFF}$		-10		+10	mV
Comparator output current	$I_{OFF}$	$V_{CC}=1$ V, $OUT1=V_{CC}$	100			$\mu$ A

## Equivalent Circuit Block Diagram



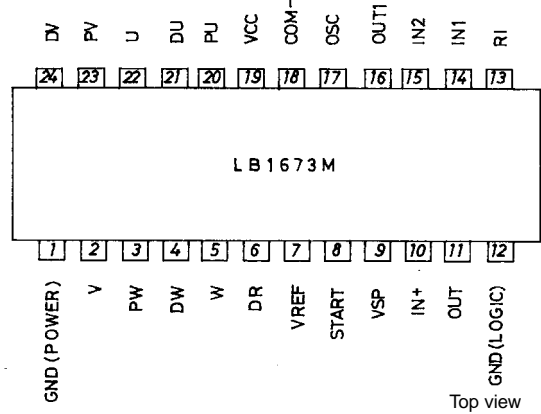
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## Sample Peripheral Circuit



Unit (resistance : Ω, capacitance : F)

## Pin Assignment



Make the capacitance of the oscillation blocking capacitor ( $C_1$ ) in the output section as small as possible and the capacitance of  $C_2$  as large as possible.

If the capacitance of the capacitor in the output section is large and the capacitance of  $C_S$  is small, the starting voltage may rise at low temperatures. In 3V-use, reverse rotation of a motor would not be well, consider the resistance of  $R_{com}$ .

## Pin Description

Pin No.	Pin name	Description
1	GND	GND pin for the whole circuit.
2	V	V phase output pin
3	PW	W phase output drive transistor base
4	DW	W phase output transistor base
5	W	W phase output pin
6	DR	Pin for selecting the direction of rotation (H : forward)
7	Vref	Reference voltage (0.5V)
8	START	High active
9	Vsp	Speed signal (induced voltage) detection
10	IN $\oplus$	Speed signal error amp reference input
11	OUT	Speed signal error amp output. The motor current is fed back.
12	GND	GND pin for logic circuit.
13	RI	Pin for detecting the motor current
14	IN1	$\ominus$ input of internal comparator (PNP base input)
15	IN2	$\oplus$ input of internal comparator (PNP base input)
16	OUT1	Output of internal comparator (NPN open collector)
17	OSC	Pin for setting the starting pulse width
18	COM $\ominus$	Pin for providing a supplementary function for the current control circuit at the time of start or selection of direction of rotation
19	V <sub>CC</sub>	Power supply pin
20	PU	U phase output drive transistor base
21	DU	U phase output transistor base
22	U	U phase output pin
23	PV	V phase output drive transistor base
24	DV	V phase output transistor base

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