


**LB1656M**

## 2-Phase Stepping Motor Driver

### Overview

The LB1656M is a dual bridge driver IC suited for use in 2-phase bipolar stepping motor driver for FDD (3 to 5.25 inches) head actuator.

The maximum driver current×voltage is 0.33A×12V/bridge.

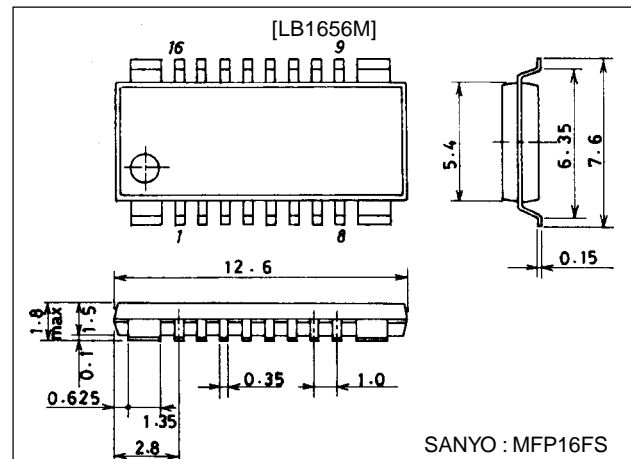
### Features

- Power save function.
- $\phi 1$ ,  $\phi 2$  direction inputs are used to make driver output selection.
- Low saturation voltage.
- Low current drain.
- Direct controllable from MPU due to low input current.
- Input level : TTL, LSTTL, 5V CMOS compatible.
- On-chip thermal shutdown (TSD) circuit.

### Package Dimensions

unit:mm

#### 3097-MFP16FS



### Specifications

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

Parameter	Symbol	Conditions	Ratings	Unit
Logic section supply voltage	V <sub>CC</sub>		7	V
Seeking supply voltage	V <sub>S1</sub>		15	V
Holding supply voltage	V <sub>S2</sub>		7	V
Input voltage	V <sub>IN</sub>		0 to V <sub>CC</sub>	V
Peak seeking current	I <sub>O peak</sub>	t≤5ms	500	mA
Continuous seeking current	I <sub>OS</sub>		330	mA
Holding current	I <sub>OH</sub>		200	mA
Allowable power dissipation	P <sub>d max</sub>		0.9	W
Operating temperature	T <sub>opr</sub>		-20 to 70	°C
Storage temperature	T <sub>stg</sub>		-55 to +125	°C

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

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Logic section supply voltage	V <sub>CC</sub>		4.5	5.0	5.5	V
Seeking supply voltage	V <sub>S1</sub>		10.2	12.0	13.8	V
Holding supply voltage	V <sub>S2</sub>		4.5	5.0	5.5	V

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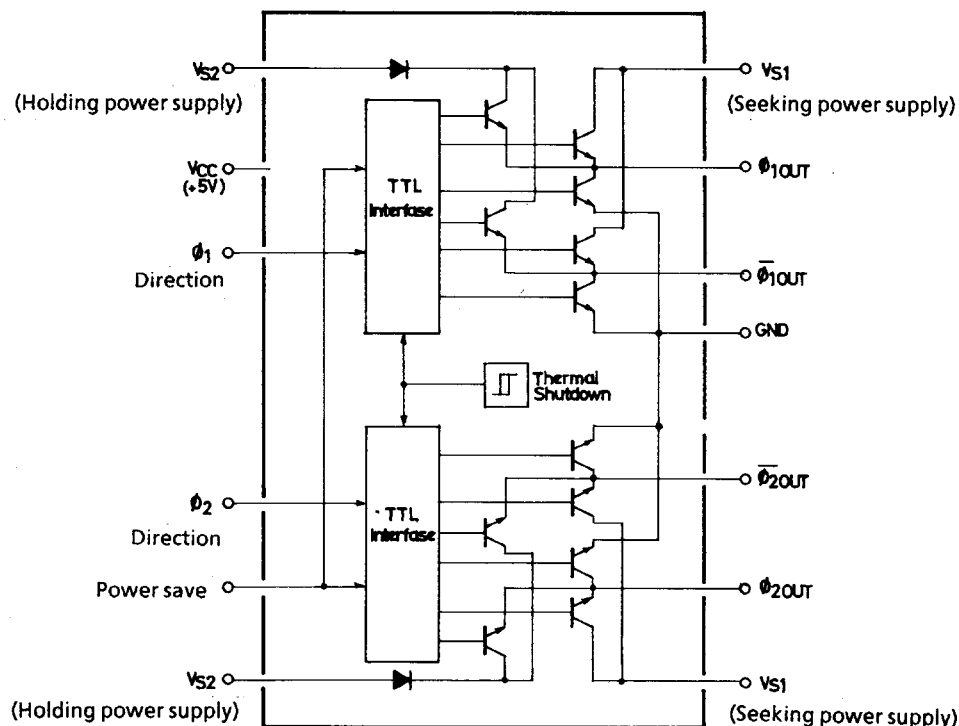
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## Electrical Characteristics at Ta = 25°C, VCC=5V, VS2=5V, VS1=12V

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Input low-level voltage	V <sub>IL</sub>				0.8	V
Input high-level voltage	V <sub>IH</sub>		2.0			V
Input low-level current	I <sub>IL</sub>	V <sub>I</sub> =0.8V	-10		+10	μA
Input high-level current	I <sub>IH</sub>	V <sub>I</sub> =2V		2	10	μA
		V <sub>I</sub> =5V		0.3	1.0	mA
		PS=0.8V, V <sub>CC</sub>		25	33	mA
		PS=0.8V, V <sub>S1</sub> , Note1		6	10	mA
		PS=0.8V, V <sub>S2</sub> , Note2			0.1	mA
		PS=2V, V <sub>CC</sub>		25	33	mA
		PS=2V, V <sub>S1</sub> , Note1		1	2	mA
Current drain	I <sub>CC</sub>	PS=2V, V <sub>S2</sub> , Note2		2.5	4	mA
		V <sub>(BR)CER</sub>	18			V
Output transistor voltage	V <sub>CE(sat)1</sub>	PS=0.8V, I <sub>O</sub> =330mA, Note3		1.5	2.0	V
V <sub>S1</sub> saturation voltage	V <sub>CE(sat)2</sub>	PS=2.0V, I <sub>O</sub> =130mA, Note3		1.5	2.0	V
Clamp voltage	V <sub>F</sub>	I <sub>F</sub> =330mA, upper		3		V
		I <sub>F</sub> =330mA, lower		1.5		V
Delay time	t <sub>PLH</sub>			4		μs
	t <sub>PHL</sub>			2		μs
TSD operating temperature	TSD			150		°C
TSD hysteresis	ΔT			25		°C

- Note : 1. Measure sum of currents at pins 4 and 13.  
2. Measure sum of currents at pins 5 and 12.  
3. Measure sum of saturation voltages at upper and lower level.

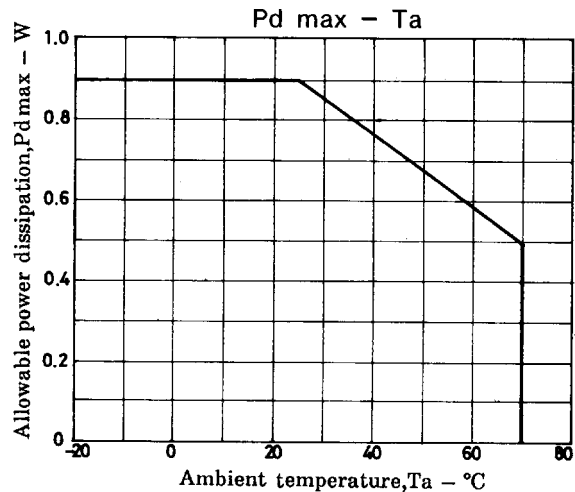
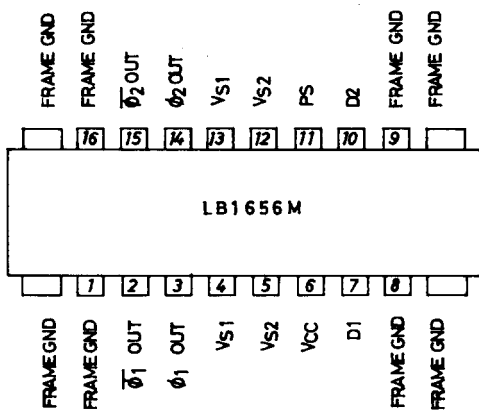
## Equivalent Circuit Block Diagram



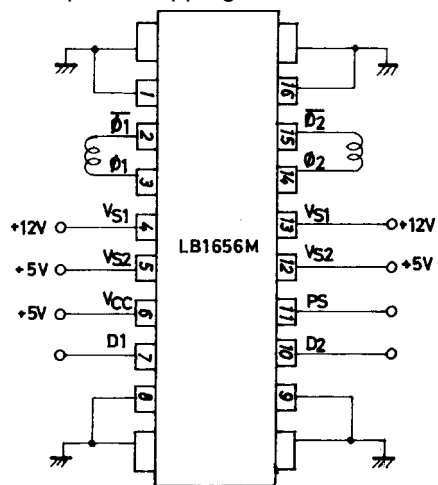
The φ1, φ2 direction inputs are used to make driver output selection and the power save input is used to select the driver source output from between 5V supply and 12V supply.

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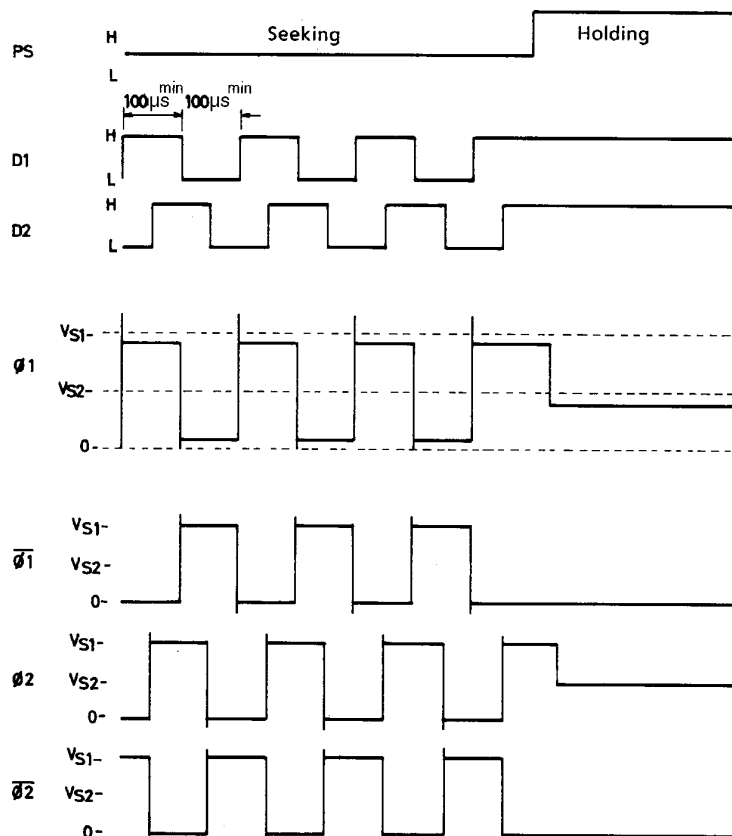
## Pin Assignment



Sample Application Circuit : 2-phase bipolar stepping motor driver.



## Timing Chart



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