



**3-Phase DD Motor Driver**

**Overview**

The LB1620 is a 3-phase DD motor driver IC especially suited for use in VCR capstan motor drive, drum motor drive, and floppy disk motor drive applications.

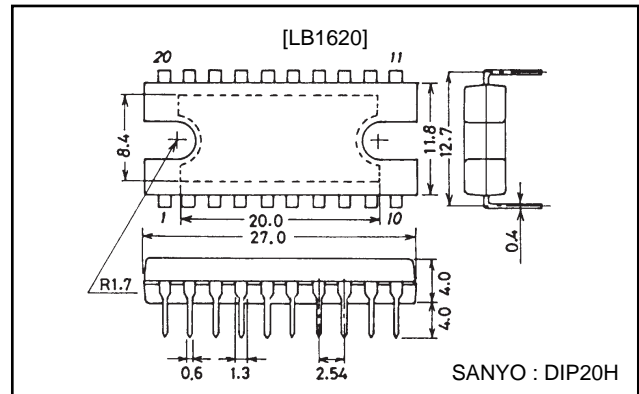
**Functions and Features**

- 3-phase motor driver.
- Capable of controlling drive current.
- On-chip 3-phase control signal generator.
- Phase/speed control pin.
- Forward/reverse rotation control pin.
- Applicable to  $\beta$ /VHS, NTSC/PAL/SECAM.

**Package Dimensions**

unit: mm

**3037A-DIP20H**



**Specifications**

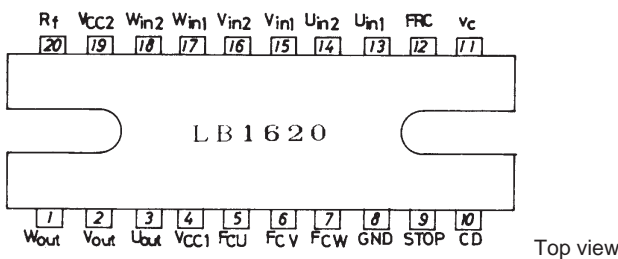
**Maximum Ratings** at  $T_a=25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	$V_{CC1}$		28	V
	$V_{CC2}$		14	V
Maximum load current	$I_L$		1.5	A
Allowable power dissipation	Pd max	Ideal heat dissipation	15	W
		Without heat sink	3	W
Operating temperature	$T_{opr}$		-20 to +75	$^\circ\text{C}$
Storage temperature	$T_{stg}$		-55 to +150	$^\circ\text{C}$

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

Parameter	Symbol	Conditions	Ratings	Unit
Supply voltage	$V_{CC1}$		8.5 to 26.4	V
	$V_{CC2}$		8.5 to 14.0	V

**Pin Assignment**



## LB1620

### Electrical Characteristics at $T_a=25^\circ\text{C}$ , $V_{CC1}=12\text{V}$ , $V_{CC2}=9\text{V}$

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Current drain	$I_{CC\ off}$	$V_c=0\text{V}$ , $V_{stop}=2\text{V}$ , $I_{CC1}+I_{CC2}$		12	18	mA
	$I_{CC\ dri}$	$V_c=7\text{V}$ , $V_{stop}=2\text{V}$ , $I_{CC1}+I_{CC2}$		22	40	mA
Saturation voltage	$V_{O(sat)1}$	$I_O=0.58\text{A}$ , $V_{CC1}=9.6\text{V}$ , $V_{O(sink)}+V_{O(source)}$			2.1	V
	$V_{O(sat)2}$	$I_O=1\text{A}$ , $V_{CC1}=18\text{V}$ , $V_{O(sink)}+V_{O(source)}$			5.0	V
In-phase voltage range			2.0		$V_{CC2}-2.5$	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)	$V_{c1}$	$R_f=0\Omega$ , $R_s=0\Omega$ , FC pin→GND current=5 $\mu\text{A}$			4.0	V
Speed control voltage (on)	$V_{c2}$	$R_f=0\Omega$ , $R_s=0\Omega$ , FC pin→GND current=0.5mA	4.5			V
	$V_{c3}$	$R_f=1\Omega$ , $R_s=100\Omega$ , $V_{Rf}=100\text{mV}$		4.6		V
Closed loop voltage gain		$R_f=1\Omega$ , $R_s=100\Omega$ , $I_L=100\text{mA}$		0.44		A/V
Input sensitivity				20		mV

### LB1620 Truth Table

	Source	Sink	Input			Forward/Reverse Control (FRC)
			U	V	W	
1	W phase → V phase		H	H	L	L
	V phase → W phase		H	H	L	H
2	W phase → U phase		H	L	L	L
	U phase → W phase		H	L	L	H
3	V phase → W phase		L	L	H	L
	W phase → V phase		L	L	H	H
4	U phase → V phase		L	H	L	L
	V phase → U phase		L	H	L	H
5	V phase → U phase		H	L	H	L
	U phase → V phase		H	L	H	H
6	U phase → W phase		L	H	H	L
	W phase → U phase		L	H	H	H

Input : "H" : Each phase input (1) is more than 0.2V higher than each phase input (2).

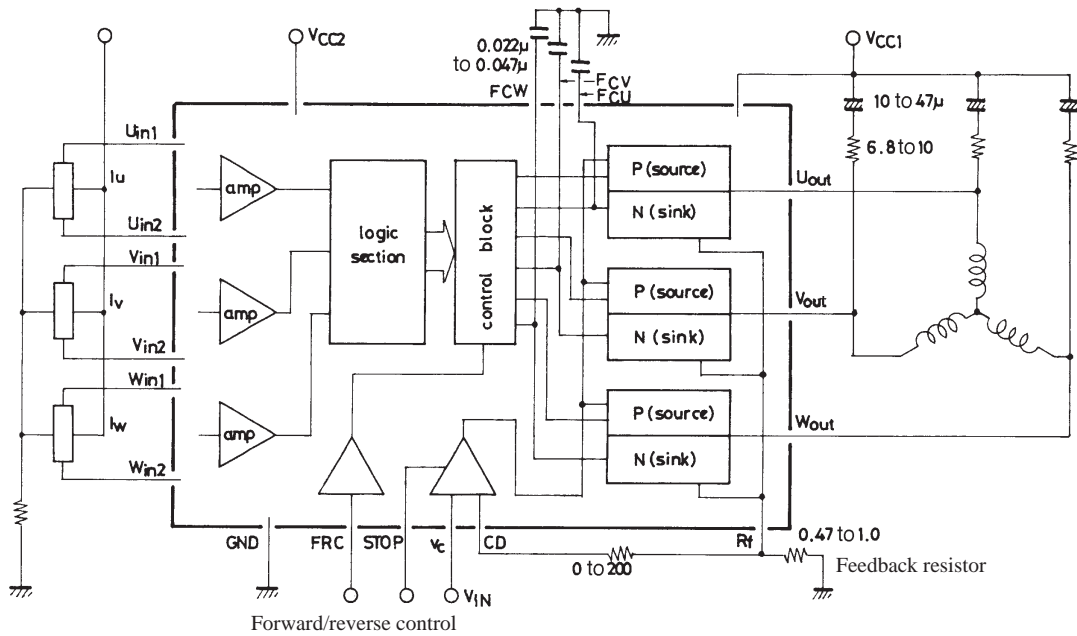
"L" : Each phase input (1) is more than 0.2V lower than each phase input (2).

Forward/reverse control : "H" : 2.0 to  $V_{CC2}$

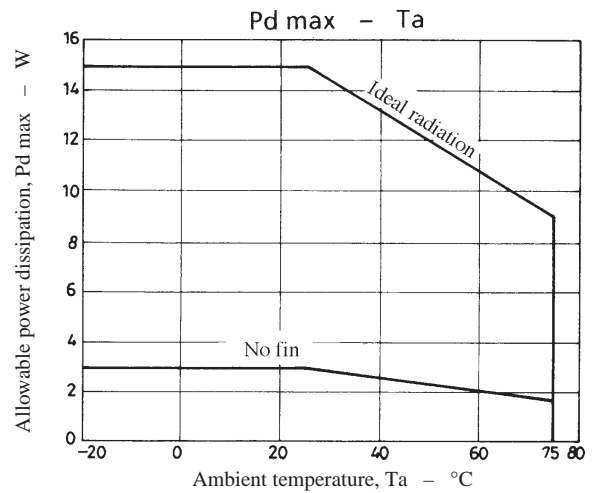
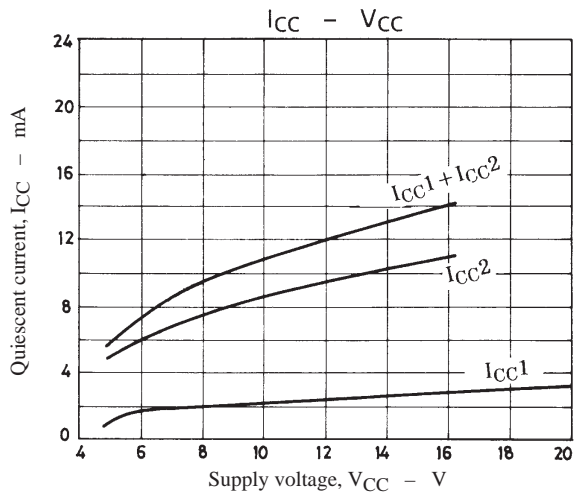
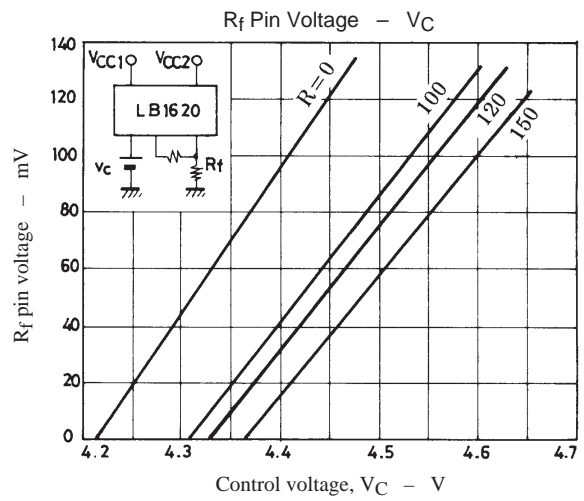
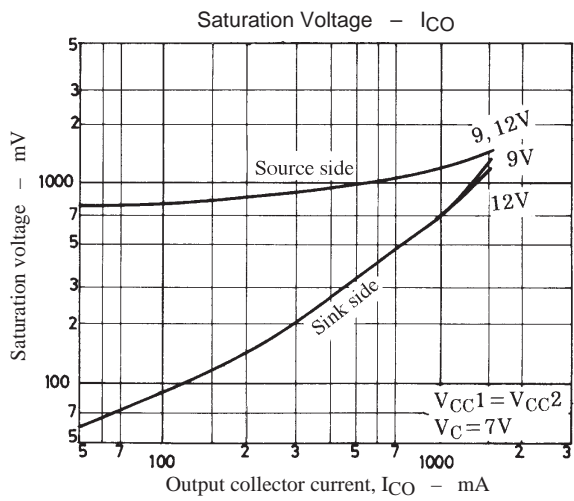
: "L" : 0 to 0.3V

# LB1620

## Equivalent Circuit Block Diagram and Peripheral Circuit



Unit (resistance :  $\Omega$ , capacitance : F)

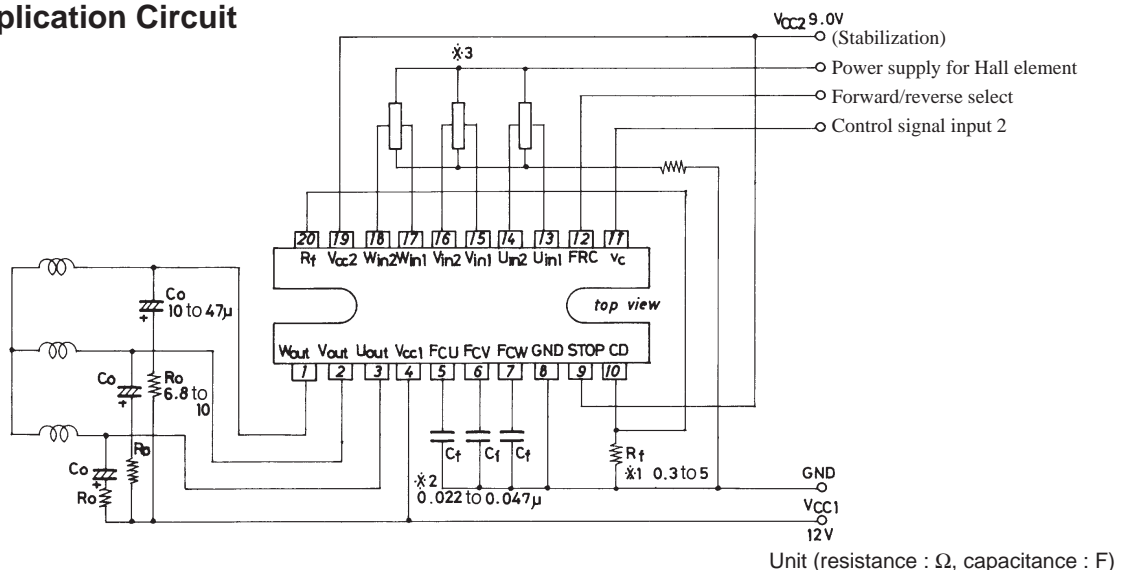


# LB1620

## Pin Description

Pin name	Pin No.	Function
U <sub>IN1</sub> , U <sub>IN2</sub>	13, 14	U phase Hall element input pin, "H" of logic : $V_{IN1} > V_{IN2}$
V <sub>IN1</sub> , V <sub>IN2</sub>	15, 16	V phase Hall element input pin, "H" of logic : $V_{IN1} > V_{IN2}$
W <sub>IN1</sub> , W <sub>IN2</sub>	17, 18	W phase Hall element input pin, "H" of logic : $V_{IN1} > V_{IN2}$
U <sub>OUT</sub>	3	U phase output pin
V <sub>OUT</sub>	2	V phase output pin
W <sub>OUT</sub>	1	W phase output pin
V <sub>CC1</sub>	4	Power supply pin for applying output
V <sub>CC2</sub>	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 <sub>f</sub>	20	Output current detect pin. By connecting R <sub>f</sub> across this pin and GND pin, output current is detected as voltage.
C <sub>D</sub>	10	Pin for fetching current (voltage) detected with R <sub>f</sub> . By connecting a resistor across C <sub>D</sub> pin and R <sub>f</sub> , speed control start voltage can be fine-adjusted.
STOP	9	Overcurrent protection pin. Voltage being lower than that on C <sub>D</sub> pin is taken to be identical to overcurrent flow, causing output to be cut off. Off-state is held. For example, if STOP pin is set to 1.5V for R <sub>f</sub> =1Ω, approximately 1.5A or more flows at output, causing output to be cut off.
F <sub>CU</sub>	5	Frequency characteristic compensation pin.
F <sub>CV</sub>	6	Closed loop oscillation in current-controlled system (including motor, F/V converter) is stopped.
F <sub>CW</sub>	7	
V <sub>C</sub>	11	Speed/phase control pin. Control starts at approximately 1/2 of V <sub>CC2</sub> . Control is of current-controlled type that controls output current. For R <sub>f</sub> =1Ω, LB1620 closed loop has gm of 0.44A/V typ, which can be adjusted by varying R <sub>f</sub> .
GND	8	GND for other than output. Minimun potential of output transistor is at R <sub>f</sub> pin.
F/R <sub>C</sub>	12	Forward/reverse rotation control pin. By setting this pin to "H" (more than 2V) / "L" (less than 0.3V), truth value is changed to perform forward/reverse rotation.

## Sample Application Circuit



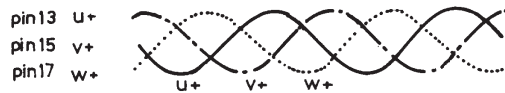
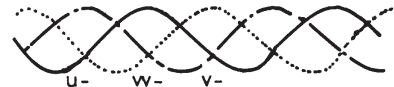
**Notes on Sample Application Circuit**

- \*1.  $R_f$  is determined by starting torque required for coil impedance F/V conversion voltage (control input).  $R_f$  should be  $0.3\Omega$  to  $5\Omega$ .
- \*2.  $C_f$  is for stopping oscillation and is determined by motor characteristic and F/V converter-included closed loop characteristic.  $C_f$  should be  $0.022\mu F$  to  $0.047\mu F$ .
- \*3. For how to connect Hall element, either parallel connection or series connection is available as long as input voltage is within the range specified.

**Timing Chart**

Forward/reverse control "L" pin 12

Forward/reverse control "H" pin 12



u	L	L	L	H	H	H	L	L	L	H	H	H
v	H	H	L	L	L	H	H	H	L	L	L	H
w	L	H	H	H	L	L	L	H	H	H	L	L

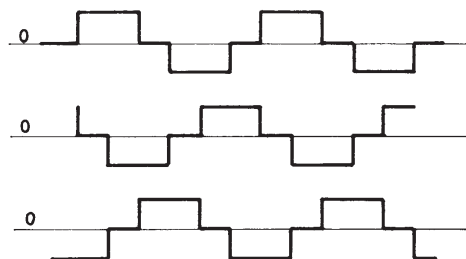
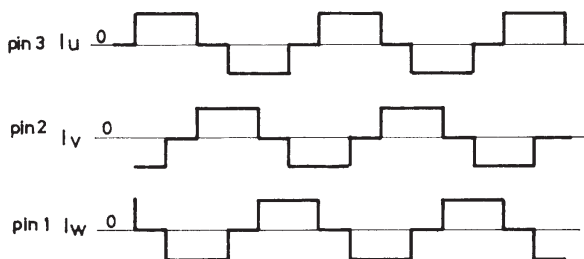
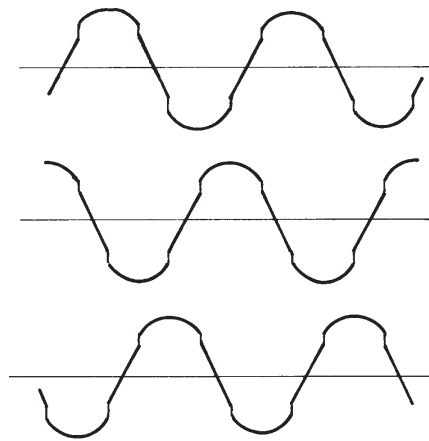
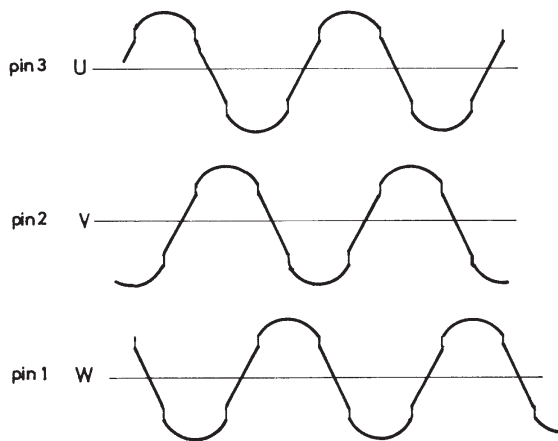
From truth table

H	H	H	L	L	L	H	H	H	L	L	L	L
H	L	L	L	H	H	H	L	L	L	H	H	H
L	L	H	H	H	L	L	L	H	H	H	L	L

From truth table

U	H	H	M	L	L	M	H	H	M	L	L	M
V	L	M	H	H	M	L	L	M	H	H	L	L
W	M	L	L	M	H	H	M	L	L	M	H	H

M	H	H	M	L	L	M	H	H	M	L	L	L
H	M	L	L	M	H	H	M	L	L	M	H	H
L	L	M	H	H	M	L	L	M	H	H	M	M



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