



**LB1688**

**3-Phase Brushless Motor Driver**

**Applications**

The LB1688 is a 3-phase brushless motor driver IC ideally suited for use in VTR capstan motor, drum motor drive applications.

**Features and Functions**

- (1) 120° voltage linear type
- (2) Soft switching type eliminating noises caused by current switching and making the values of external capacitors smaller (comparable to those of chip capacitors)
- (3) On-chip thermal shutdown

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

Parameter	Symbol	Value	Unit
Maximum Supply Voltage	V <sub>CC</sub> max1	20	V
	V <sub>CC</sub> max2	7.0	V
Output Supply Voltage	V <sub>OUT.v.w.</sub>	22	V
Output Current	I <sub>OUT</sub>	1.5	A
Allowable Power Dissipation	P <sub>d</sub> max	2.1	W
Operating Temperature	T <sub>opr</sub>	-20 to +75	°C
Storage Temperature	T <sub>stg</sub>	-55 to +125	°C

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

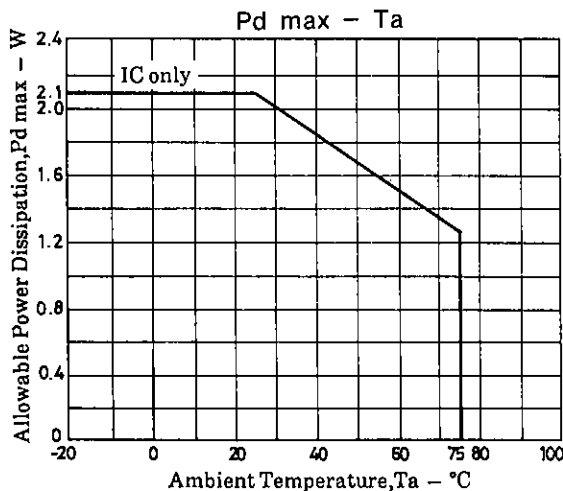
Parameter	Symbol	Value	Unit
Supply Voltage	V <sub>CC1</sub>	8.5 to 18	V
	V <sub>CC2</sub>	4.3 to 6.5	V

**Electrical Characteristics at Ta = 25°C, V<sub>CC1</sub> = 12V, V<sub>CC2</sub> = 5V**

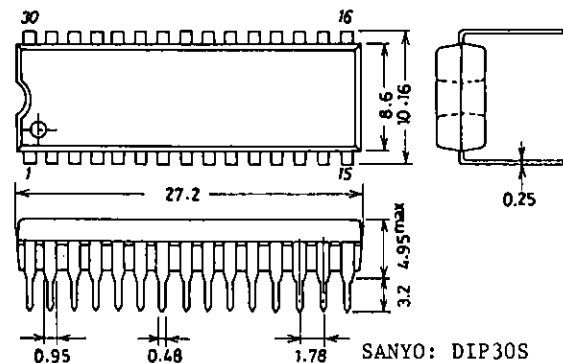
[Power Supply]

Parameter	Symbol	Condition	min	typ	max	unit
Supply Current 1	I <sub>CC1</sub>	V <sub>C</sub> = 0, R <sub>L</sub> = ∞		17	30	mA
Supply Current 2	I <sub>CC2</sub>	V <sub>C</sub> = 0		6.5	9.5	mA

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**Package Dimensions 3061-D30SNIC (unit: mm)**



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LB1688

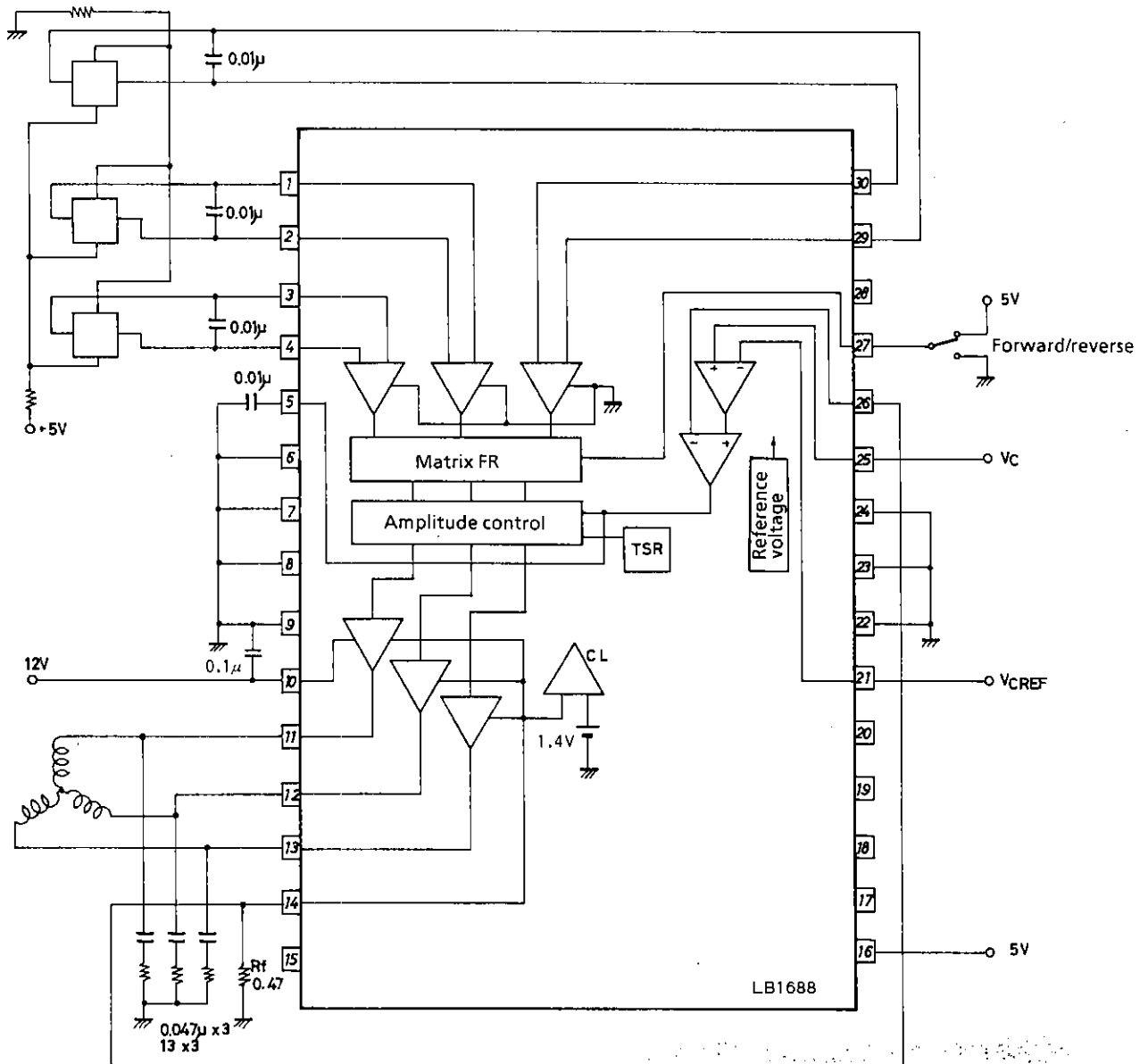
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			min	typ	max	unit
[Output]						
Output Saturation Voltage	$V_{O(sat)1}$	$I_{OUT}=0.5A, \text{sink} + \text{source}$		1.6	2.2	V
	$V_{O(sat)2}$	$I_{OUT}=1.0A, \text{sink} + \text{source}$		2.0	3.0	V
Output TRS Voltage	$V_{O(sus)}$	$I_{OUT}=20mA$ (See note.)	20			V
Output Quiescent Voltage	$V_{OQ}$	$V_C=0$	5.8	6.1	6.4	V
[Hall Input-Output]						
Hall Amp Input Offset Voltage	$V_H \text{ offset}$		-5		+5	mV
Hall Amp Input Bias Current	$I_H \text{ bias}$			1	5	$\mu A$
Hall Amp Common-Mode	$V_H \text{ ch}$		1.3		3.7	V
Input Voltage Range						
Hall Input-Output Voltage Gain	$G_{VHO}$			43		dB
[Control-Output]						
Control-Output Drive Gain	$G_{VCO}$		38	41	44	dB
Control-Output CH Difference	$\Delta G_{VCO}$		-2		+2	dB
[Motor Detection]						
Thermal Shutdown Temperature	$T_{SD}$	(See note.)	150	180	210	$^{\circ}C$
Thermal Shutdown Hysteresis	$\Delta T_{SD}$	(See note.)		15		$^{\circ}C$

Note : Values shown are design targets only. No measurements have been taken.

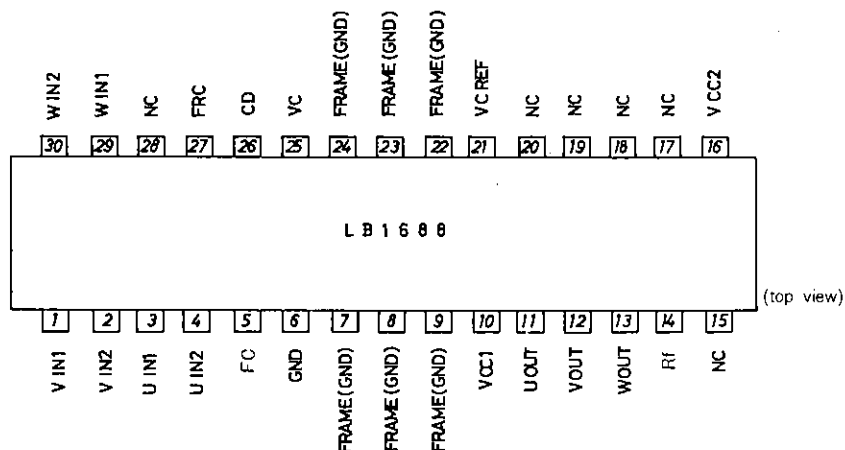
Equivalent Circuit Block Diagram

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



# LB1688

## Pin Assignment



Note : All FRAME pins are connected to GND.

## Pin Description

Pin Name	Pin No.	Description
U <sub>IN1</sub> , U <sub>IN2</sub>	3, 4	U phase hall element input pin. 'H' of logic : V <sub>IN1</sub> > V <sub>IN2</sub>
V <sub>IN1</sub> , V <sub>IN2</sub>	1, 2	V phase hall element input pin. 'H' of logic : V <sub>IN1</sub> > V <sub>IN2</sub>
W <sub>IN1</sub> , W <sub>IN2</sub>	29, 30	W phase hall element input pin. 'H' of logic : V <sub>IN1</sub> > V <sub>IN2</sub>
U <sub>OUT</sub>	11	U phase output pin
V <sub>OUT</sub>	12	V phase output pin
W <sub>OUT</sub>	13	W phase output pin
V <sub>CC1</sub>	10	Power supply pin for applying output
V <sub>CC2</sub>	16	Power supply pin for applying voltage to each section other than output section. This voltage must be stabilized to be free from ripple, noise, etc.
R <sub>f</sub>	14	Output current detect pin. By connecting R <sub>f</sub> across this pin and GND pin, output current is detected as voltage. The result is used to control the overcurrent protection circuit.
CD	26	Pin for fetching current (voltage) detected with R <sub>f</sub> . Takes feedback from R <sub>f</sub> to reduce output voltage gain. Ground when not in use.
FC	5	Frequency characteristic correction
V <sub>C</sub>	25	Speed-phase control pin Control is of voltage-controlled type that controls output voltage.
V <sub>CREF</sub>	21	Control reference voltage
GND	6	GND for other than output Minimum potential of output transistor is at R <sub>f</sub> pin.
F/RC	27	Forward/reverse control pin By setting this pin to 'H' (more than 2.0V)/'L' (less than 0.3V), truth value is changed to perform forward/reverse rotation.

Truth Table

	Source Sink	Input			Forward/Reverse Control F/R/C
		U	V	W	
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

Input:

H: High level. One of the inputs should have a potential at least 0.2V higher than the other.

L: Low level. One of the inputs should have a potential at least 0.2V lower than the other.

Forward/reverse control:

H: 2.0 to  $V_{CC2}$

L: 0 to 0.3V

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