



**LB1687**

**3-Phase Brushless Motor Driver**

**Applications**

The LB1687 is a 3-phase brushless motor driver IC ideally suited for use in VTR capstan motor, drum motor drive applications.

**Features and Functions**

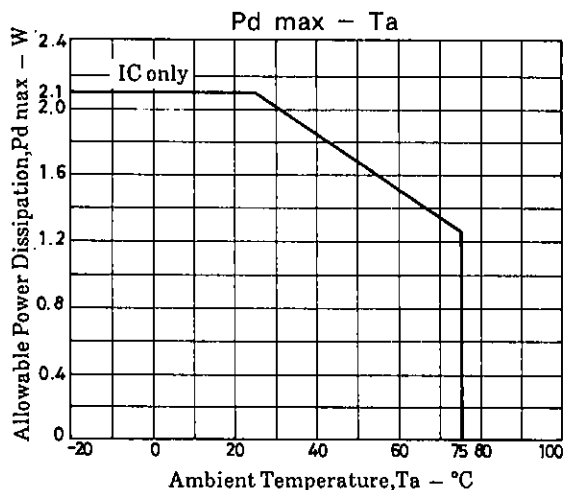
- (1) 120° voltage linear type
- (2) Soft switching type eliminating noises caused by current switching and making the values of external capacitors smaller (comparable to those of chip capacitors)
- (3) On-chip FG amplifier
- (4) On-chip thermal shutdown circuit
- (5) The FG signal can be used to detect the rotational speed of a motor so that the hall amp gain is changed in two steps, thus reducing torque ripple and noise.
- (6) Motor drivable at voltage down to motor supply voltage 5V

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

			unit
Maximum Supply Voltage	V <sub>CC max1</sub>	20	V
	V <sub>CC max2</sub>	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 max</sub>	2.1	W
Operating Temperature	T <sub>opr</sub>	-20 to +75	°C
Storage Temperature	T <sub>stg</sub>	-55 to +125	°C

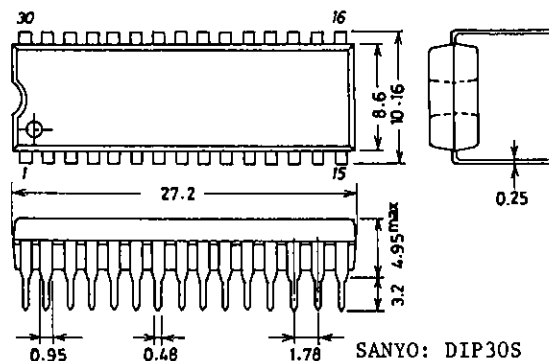
**Allowable Operating Conditions at Ta = 25°C**

			unit
Supply Voltage	V <sub>CC1</sub>	5 to 18	V
	V <sub>CC2</sub>	4.3 to 6.5	V



**Package Dimensions 3061**

(unit: mm)

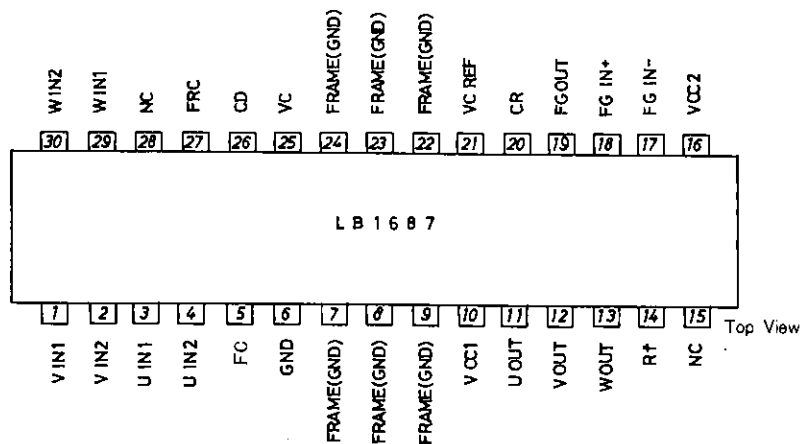


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Electrical Characteristics at Ta=25°C, VCC1=12V, VCC2=5V				min	typ	max	unit
[Power Supply]							
Supply Current 1	ICC1	VC=0, RL=∞		17	30		mA
Supply Current 2	ICC2	VC=0		6.5	9.5		mA
[Output]							
Output Saturation Voltage	VO(sat)1	IOUT=0.5A, sink + source		1.6	2.2		V
	VO(sat)2	IOUT=1.0A, sink + source		2.0	3.0		V
Output TRS Voltage	VO(sus)	IOUT=20mA (See note.)	20				V
Output Quiescent Voltage	VOQ	VC=0	5.8	6.1	6.4		V
[Hall Input-Output]							
Hall Amp Input Offset Voltage	VH offset		-5		+5		mV
Hall Amp Input Bias Current	IH bias			1	5		µA
Hall Amp Common-Mode	VH ch		1.3		3.7		V
Input Voltage Range							
Hall Input-Output Voltage Gain	GVHO1			56			dB
	GVHO2			43			dB
[Control-Output]							
Control-Output Drive Gain	GVCO		38	41	44		dB
Control-Output CH Difference	ΔGVCO		-2		+2		dB
[FG Amplifier]							
FG Amp Input Offset Voltage	VFG offset		-8		+8		mV
Open-Loop Voltage Gain	GVFG	f=1kHz		60			dB
Source Output Saturation Voltage	VFG OU	IO=2mA	3.7				V
Sink Output Saturation Voltage	VFG OD	IO=-2mA			1.3		V
Common-Mode Signal	CHR	(See note.)		80			dB
Rejection Ratio							
FG Amp Common-Mode	VFG CH		0		3.5		V
Input Voltage Range							
Phase Margin		(See note.)		20			deg.
[Motor Detection]							
Motor Detection Amp			35	50	65		mV
Hysteresis Width							
CR Pin Threshold Voltage		VCR changes from LOW to HIGH.	2.35	2.5	2.65		V
Thermal Shutdown Temperature	TSD	(See note.)	150	180	210		°C
Thermal Shutdown Hysteresis	ΔTSD	(See note.)		15			°C

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

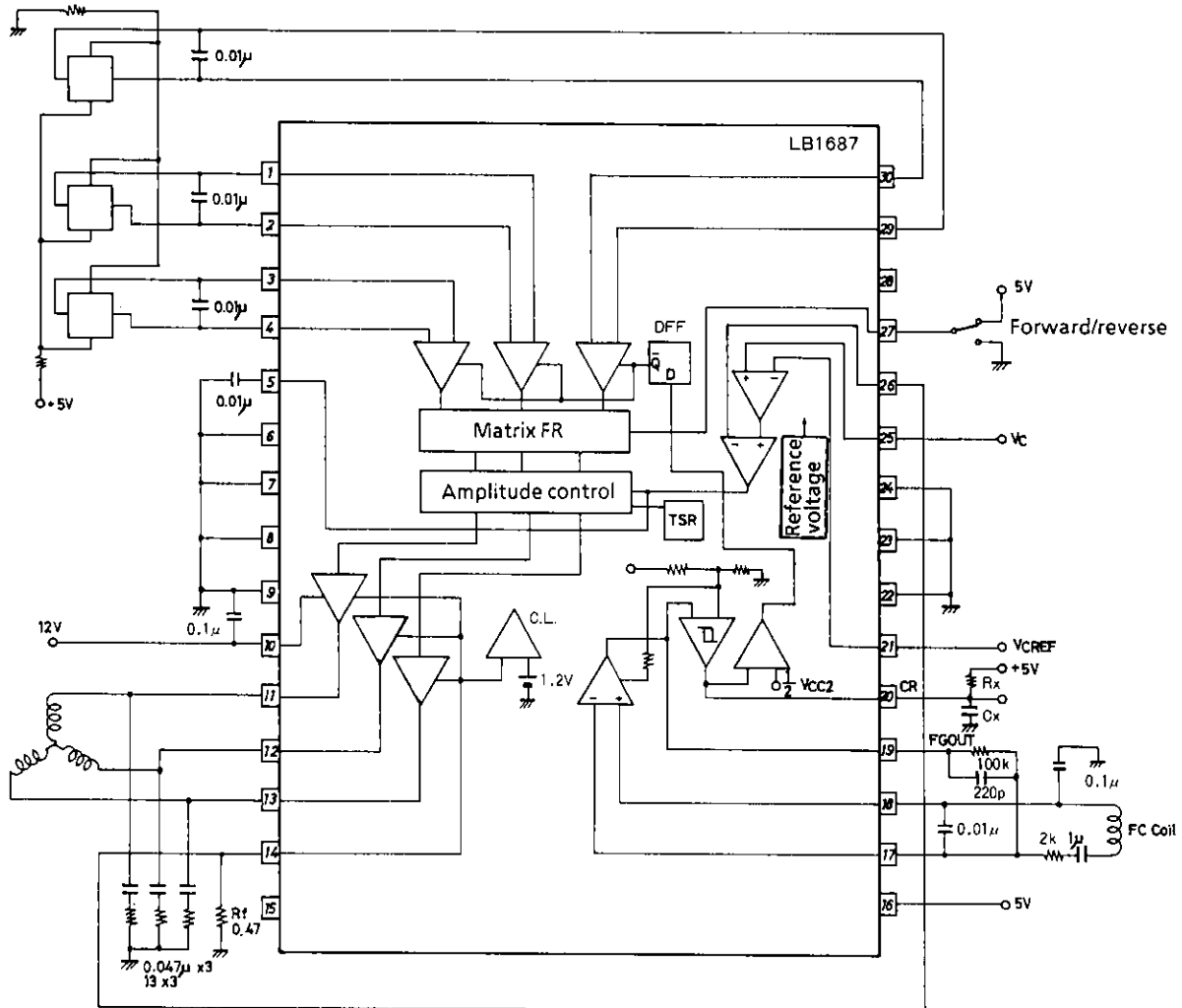
Pin Assignment



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## Equivalent Circuit Block Diagram

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



## Truth Table

	Source	Sink	Input			Forward/Reverse Control
			U	V	W	F/RC
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: 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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