Ordering number:ENN3345

Monolithic Digital IC

LB1687

3-Phase Brushless Motor Driver

Applications

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

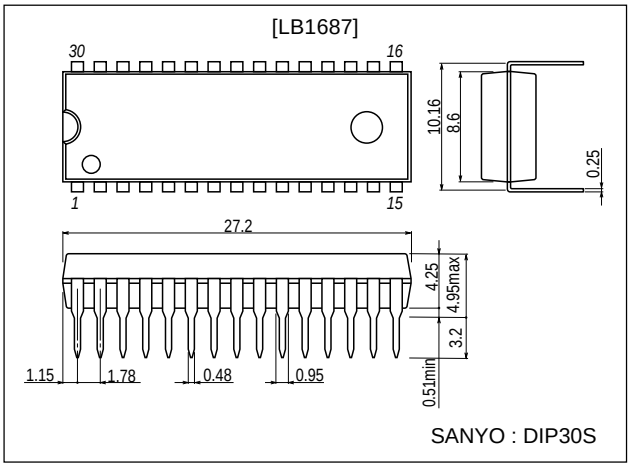
Features and Functions

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

Package Dimensions

unit:mm

3061-DIP30S



Specifications

Absolute Maximum Ratings at Ta = 25˚C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V_{CC} max1		20	V
	V_{CC} max2		7.0	V
Output supply voltage	$V_{OUT.V.W}$		22	V
Output current	I_{OUT}		1.5	A
Allowable power dissipation	Pd max		2.1	W
Operating temperature	Topr		–20 to +75	˚C
Storage temperature	Tstg		–55 to +125	˚C

Allowable Operating Ranges at Ta = 25˚C

Parameter	Symbol	Conditions	Ratings	Unit
Supply voltage	$V_{CC}1$		5 to 18	V
	$V_{CC}2$		4.3 to 6.5	V

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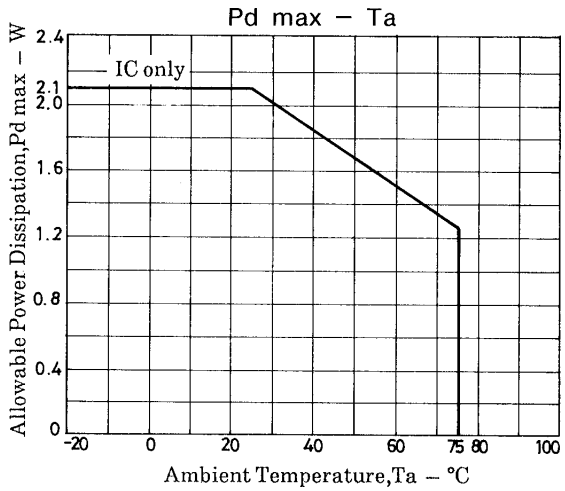
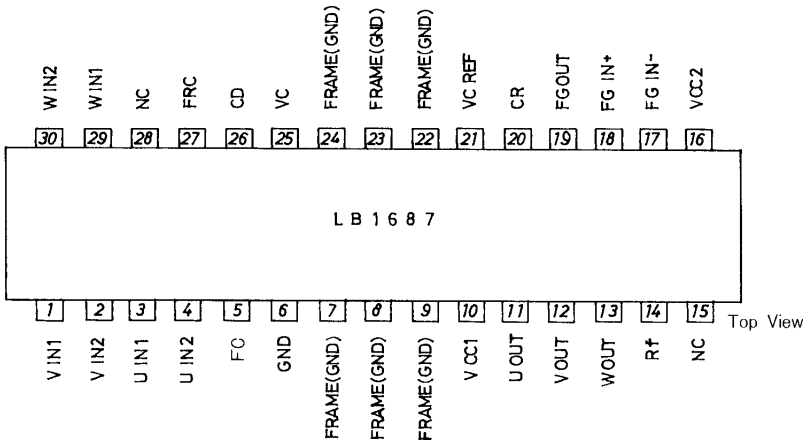
Electrical Characteristics at Ta = 25˚C, $V_{CC}1$=12V, $V_{CC}2$=5V

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
[Power supply]						
Supply current 1	$I_{CC}1$	V_C=0, R_L=∞		17	30	mA
Supply current 2	$I_{CC}2$	V_C=0		6.5	9.5	mA
[Output]						
Output saturation voltage	$V_{O(sat)}1$	I_{OUT}=0.5A, sink+source		1.6	2.2	V
	$V_{O(sat)}2$	I_{OUT}=1.0A, sink+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 amplifier input offset voltage	V_H offset		–5		+5	mV
Hall amplifier input bias current	I_H bias			1	5	µA
Hall amplifier common-mode input voltage range	V_H ch		1.3		3.7	V
Hall input-output voltage gain	$G_{VHO}1$			56		dB
	$G_{VHO}2$			43		dB
[Control-output]						
Control-output drive gain	G_{VCO}		38	41	44	dB
Control-output CH difference	ΔG_{VCO}		–2		+2	dB
[FG amplifier]						
FG amplifier input offset voltage	VFG offset		–8		+8	mV
Open-loop voltage gain	G_{VFG}	f=1kHz		60		dB
Source output saturation voltage	$V_{FG\ OU}$	I_O=2mA	3.7			V
Sink output saturation voltage	$V_{FG\ OD}$	I_O=–2mA			1.3	V
Common-mode signal rejection ratio	CHR	(See note.)		80		dB
FG amplifier common-mode input voltage range	$V_{FG\ CH}$		0		3.5	V
Phase margin		(See note.)		20		deg.
[Motor detection]						
Motor detection amplifier hysteresis width			35	50	65	mV
CR pin threshold voltage		VCR changes from LOW to HIGH.	2.35	2.5	2.65	V
Thermal shutdown temperature	T_{SD}	(See note.)	150	180	210	˚C
Thermal shutdown hysteresis	ΔT_{SD}	(See note.)		15		˚C

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

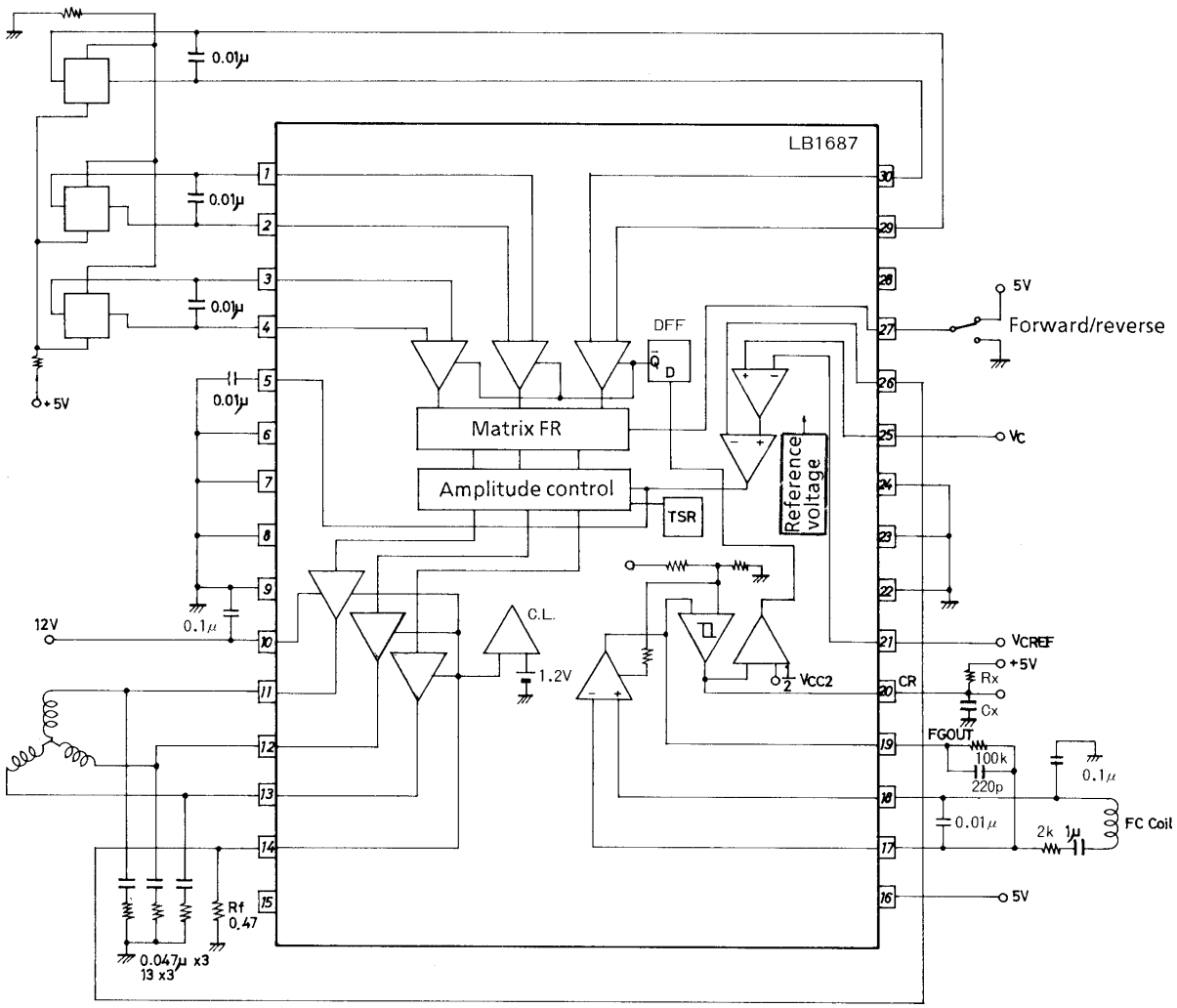


Pin Assignment



Equivalent Circuit Block Diagram

Unit (resistance: Ω, capacitance: F)



Truth Table

	Source / sink	Input U	Input V	Input W	Forward/Reverse Control F/RC
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 $V_{CC}2$
- L : 0 to 0.3V