Ordering number :ENN*6212A

Monolithic Digital IC

LB11987

Refrigerator Fan Motor Driver

Preliminary

Functions

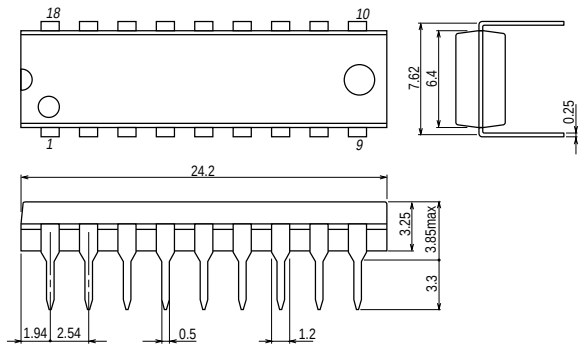
- Three-phase full-wave current linear drive
- Built-in current limiter circuit
- Built-in saturation prevention circuits in both the upper and lower sides of the output stage.
- FG amplifier
- Thermal shutdown circuit

Package Dimensions

unit: mm

3007A-DIP18

[LB11987]



SANYO: DIP18

Specifications

Absolute Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V_{CC}max		24	V
	$V_S$max		24	V
Maximum output current	$I_{O\ max}$		1.3	A
Allowable power dissipation	Pdmax	Independent IC	1.13	W
Operating temperature	Topr		–30 to +75	°C
Storage temperature	Tstg		–55 to +150	°C

Allowable Operating Ranges at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Supply voltage	V_S		5 to 22	V
	V_{CC}		7 to 22	
Hall input amplitude	V_{HALL}	Between Hall inputs	±30 to ±80	mV 0-P

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Electrical Characteristics at Ta = 25°C, V_{CC} = 12 V, Vs = 12V

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
V_{CC} current drain	I_{CC}	R_L = 560 Ω (Y)		15	24	mA
[Output]						
Output saturation voltage	$V_{Osat}1$	I_O = 500 mA, Rf = 0.5 Ω, Sink + Source (Saturation prevention function included)		2.1	2.6	V
	$V_{Osat}2$	I_O = 1.0 A, Rf = 0.5 Ω, Sink + Source (Saturation prevention function included)		2.6	3.5	V
Output leakage current	I_{Oleak}				1.0	mA
[Hall Amplifier]						
Input offset voltage	V_{off} (HALL)		–6		+6	mV
Input bias current	I_b (HALL)	V_{IN}, W_{IN}		1	3	µA
Common-mode input voltage	V_{cm} (HALL)		3		V_{CC} – 3	V
[Current Limiter]						
LIM pin current limit level	I_{LIM}	Rf = 0.5 Ω, With the Hall input logic states fixed (U, V, W = high, high, low)		1		A
[Saturation]						
Saturation prevention circuit lower side voltage setting	V_{Osat} (DET)	R_L = 560 Ω (Y), Rf = 0.5 Ω, The voltage between each output and the corresponding Rf.		0.28		V
[FG Amplifier]						
Upper side output saturation voltage	V_{satu} (SH)		11.8			V
Lower side output saturation voltage	V_{satd} (SH)				0.3	V
Hysteresis	Vhys			23		mV
TSD operating temperature	T-TSD	Design target value*		170		°C

Note *: Items shown to be design target values in the conditions column are not measured.

Truth Table and Control Functions

	Source → sink	Hall input		
		U	V	W
1	W → V	H	H	L
2	W → U	H	L	L
3	V → U	H	L	H
4	V → W	L	L	H
5	U → W	L	H	H
6	U → V	L	H	L

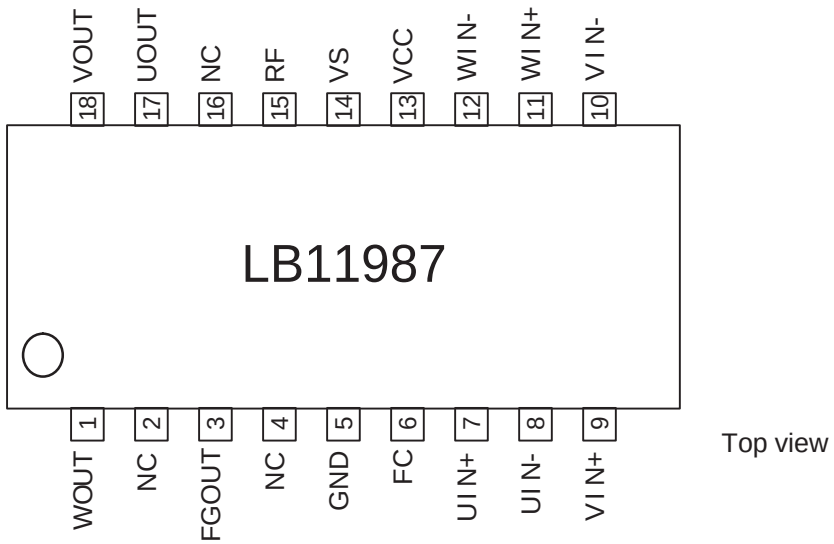
Note: For the Hall inputs, the input high state is defined to be the state where the (+) input is at least 0.01 V higher than the corresponding (–) input, and the input low state is defined to be the state where the (+) input is at least 0.01 V lower than the corresponding (–) input.

Note: Since this drive technique is a 180° current application scheme, the phases other than the sink and the source phases will not turn off.

Pin Functions

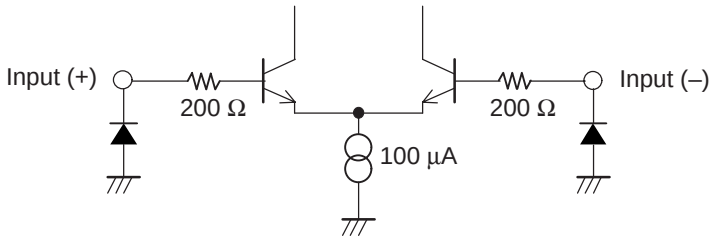
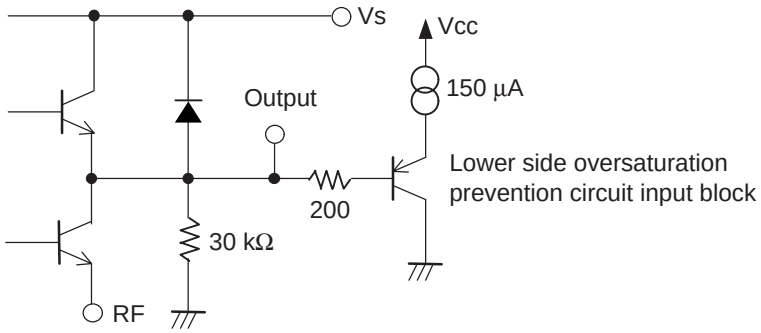
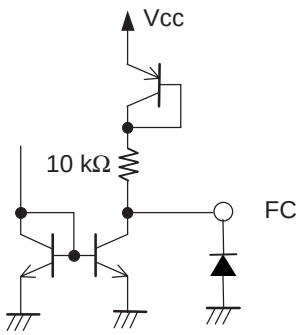
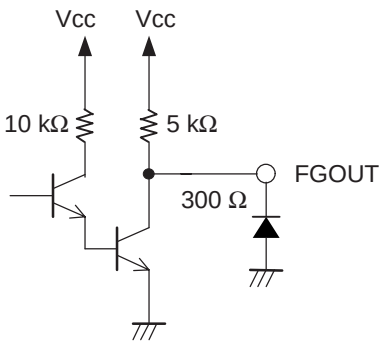
Pin No.	Pin	Function
5	GND	Ground for circuits other than the output transistors. Note that the Rf pin will be at the lowest potential of the output transistors.
3	FG-OUT	This is the FG amplifier output pin. Internally, it is a resistive load. (Pull up)
6	FC	Corrects the frequency characteristics of the saturation prevention circuit loop.
7, 8	U_{IN}+, U_{IN}–	U-phase Hall input. Logic high refers to the state where IN+ > IN–.
9, 10	V_{IN}+, V_{IN}–	V-phase Hall input. Logic high refers to the state where IN+ > IN–.
11, 12	W_{IN}+, W_{IN}–	W-phase Hall input. Logic high refers to the state where IN+ > IN–.
13	V_{CC}	Power supply provided to all IC internal circuits other than the output block. This voltage must be stabilized so that ripple and noise do not enter the IC.
14	V_S	Output block power supply
15	Rf	Used for output current detection. The current limiter circuit operates using the resistor (Rf) connected between this pin and ground. Note that the lower side saturation prevention circuit operates according to the voltage that appears on this pin. Since the over-saturation level is set by this voltage, the level of the lower side saturation prevention circuit may be degraded in the large current region if the value of Rf is made extremely small.
17	U_{OUT}	U-phase Hall output (These pins include internal spark killer diodes.)
18	V_{OUT}	V-phase Hall output
1	W_{OUT}	W-phase Hall output

Pin Assignment

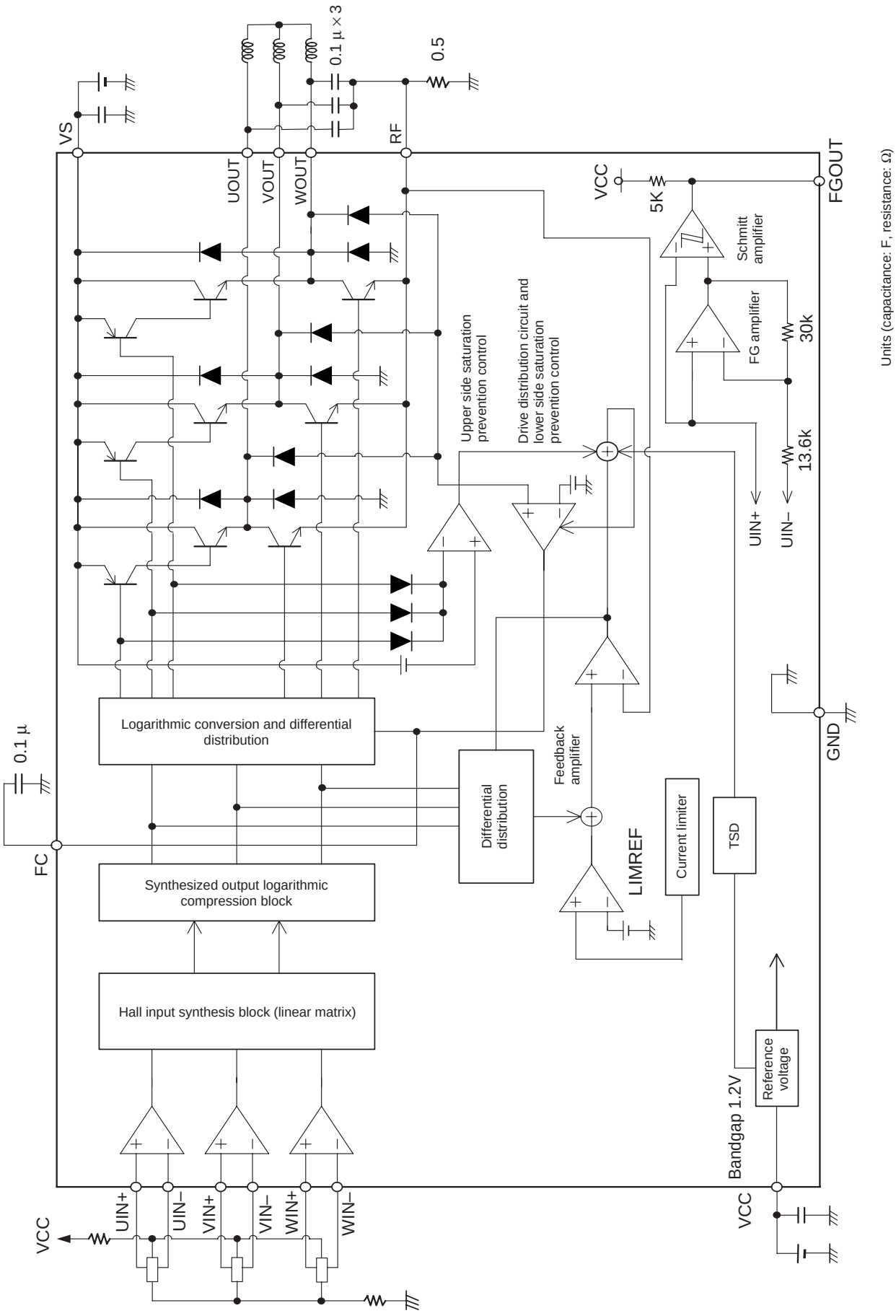


Top view

Equivalent Circuit Diagrams

Pin	Equivalent circuit diagrams
U_{IN} (+) U_{IN} (–) V_{IN} (+) V_{IN} (–) W_{IN} (+) W_{IN} (–)	
U – OUT V – OUT W – OUT RF V_S	
FC	
FGOUT	

Block Diagram



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