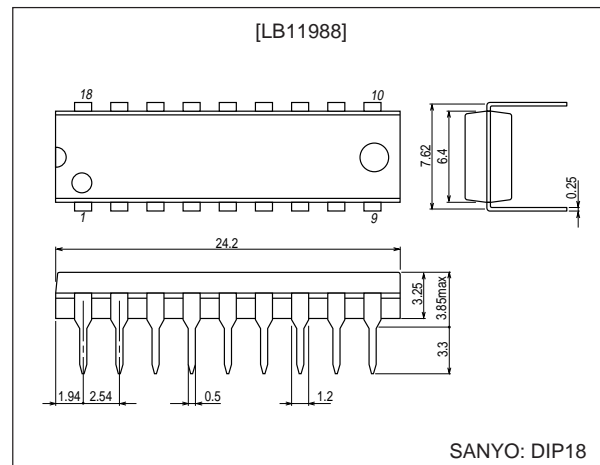


**LB11988****Refrigerator Fan Motor Driver****Functions**

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

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V_{CCmax}		24	V
	V_Smax		24	V
Maximum output current	I_{Omax}		1.3	A
Allowable power dissipation	P_{dmax}	Independent IC	1.13	W
Operating temperature	T_{opr}		-30 to +75	°C
Storage temperature	T_{stg}		-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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N0999RM (OT) No. 6211-1/6

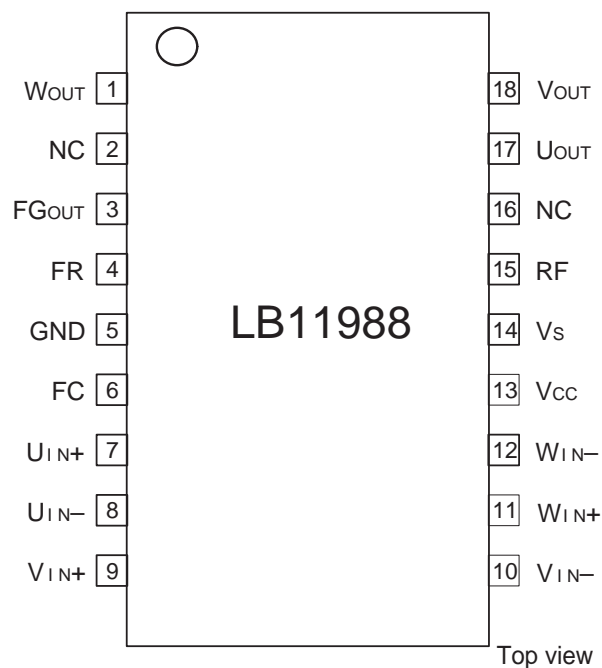
LB11988

Electrical Characteristics at $T_a = 25^\circ\text{C}$, $V_{CC} = 12\text{ V}$, $V_S = 12\text{ V}$

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
V_{CC} current drain	I_{CC}	$R_L = 560\ \Omega$ (Y)		15	24	mA
[Output]						
Output saturation voltage	V_{Osat1}	$I_O = 500\text{ mA}$, $R_f = 0.5\ \Omega$, Sink + Source (Saturation prevention function included)		2.1	2.6	V
	V_{Osat2}	$I_O = 1.0\text{ A}$, $R_f = 0\ \Omega$, 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
[FR]						
Threshold voltage	V_{FRTH}		4		8	V
Input bias current	I_b (FR)		-5			μA
[Current Limiter]						
LIM pin current limit level	I_{LIM}	$R_f = 0.5\ \Omega$, 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)	$R_L = 560\ \Omega$ (Y), $R_f = 0.5\ \Omega$, The voltage between each lower output and the corresponding R_f .		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	V_{hys}			23		mV
TSD operating temperature	T-TSD	Design target value*		170		$^\circ\text{C}$

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

Pin Assignment



Truth Table and Control Functions

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

Note: The "H" state for FR is defined as a voltage of 8 V or higher, and the "L" state for FR is defined as a voltage of 4 V or lower. (When $V_{CC} = 12\text{ V}$.)

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

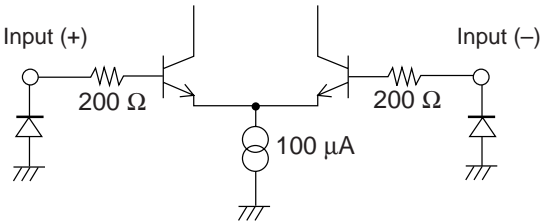
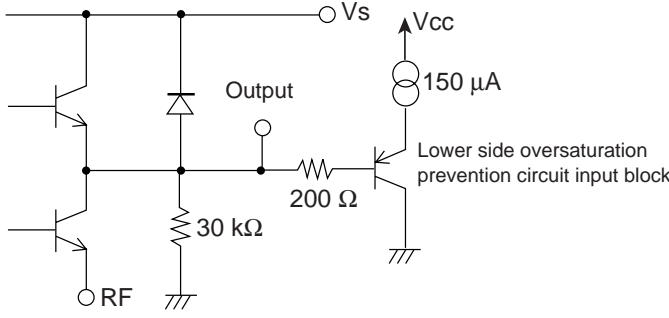
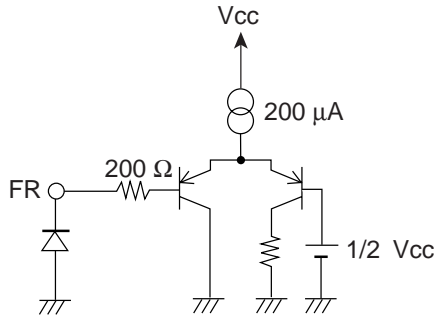
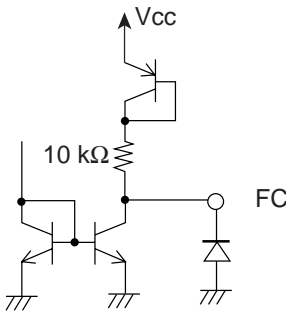
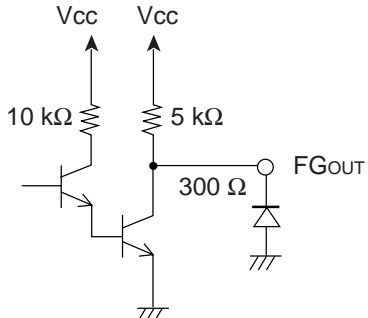
Note: Since this drive technique is a 180° current application scheme, the phases other than the sink and the source phases will not turn off.

Pin Functions

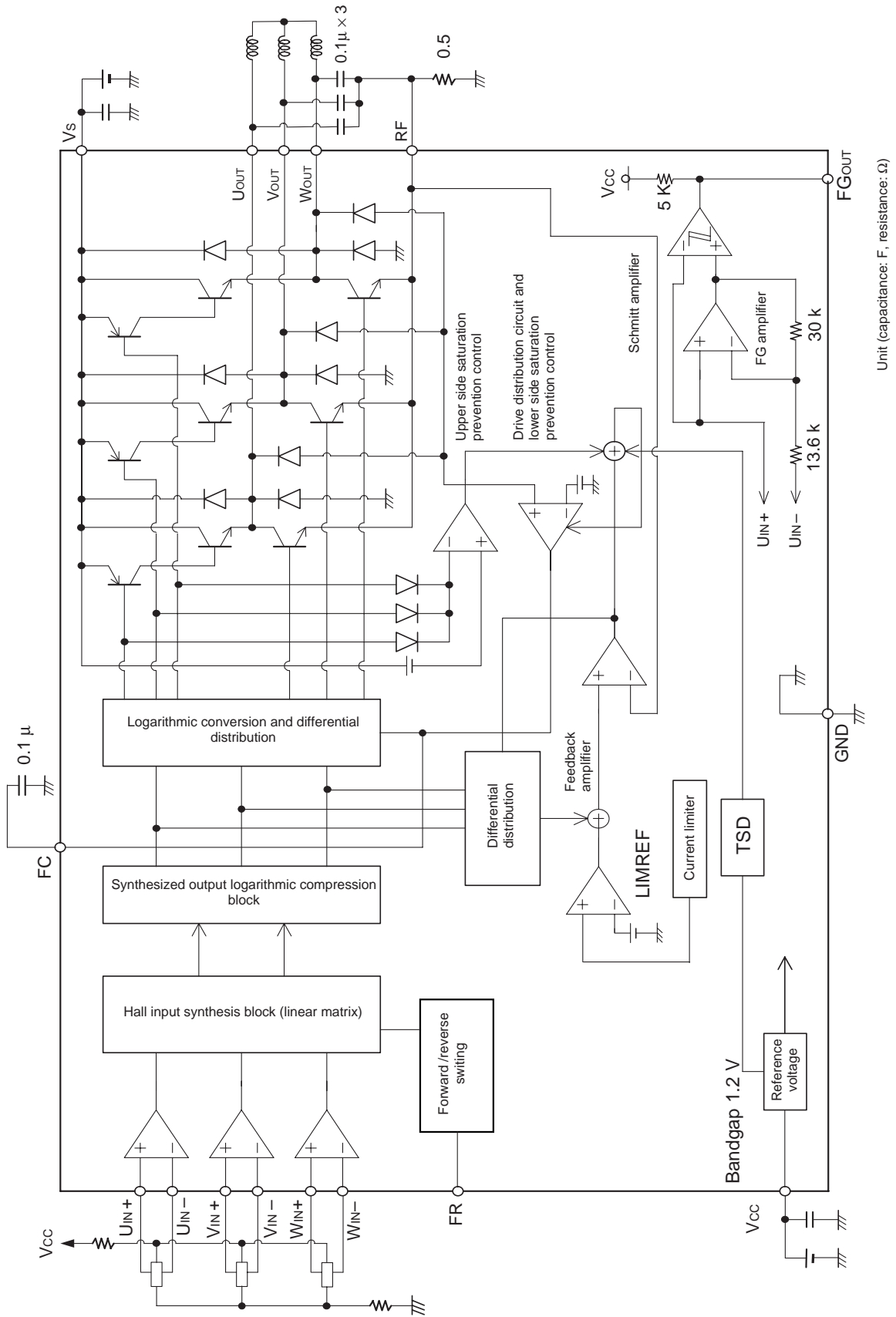
Pin No.	Pin	Function
5	GND	Ground for circuits other than the output transistors. Note that the Rf pin will be at the lowest potential of the output transistors.
3	FG-OUT	This is the FG amplifier output pin. Internally, it is a resistive load.
4	FR	Forward/reverse switching pin
6	FC	Corrects the frequency characteristics of the saturation prevention circuit loop and current limiter circuit.
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 response 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
18	V_{OUT}	V-phase Hall output
1	W_{OUT}	W-phase Hall output

(These pins include internal spark killer diodes.)

Equivalent Circuit Diagrams

Pin	Equivalent circuit diagrams
<p>U_{IN} (+) U_{IN} (-) V_{IN} (+) V_{IN} (-) W_{IN} (+) W_{IN} (-)</p>	
<p>U_{OUT} V_{OUT} W_{OUT} RF Vs</p>	
<p>FR</p>	
<p>FC</p>	
<p>FG_{OUT}</p>	

Block Diagram



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