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# LA6587FA

Monolithic Linear IC

Fan Motor Driver

BTL Driver Single-Phase Full-Wave

## Overview

The LA6587FA is single-phase bipolar fan motor is driven, through BTL output linear drive, at high efficiency, low power, and low sound by suppressing the reactive power. Lock protection, rotary signal (FG, 1/2FG) circuits are incorporated, which is optimum for the notebook PC, consumer equipment power supply, car audio system, CPU cooler, etc. that require high reliability and low noise.

## Functions

- Single-phase full-wave linear drive by BTL output (gain resistance 1kΩ-360kΩ, 51dB)
  - : No switching noise, which is optimum for equipment requiring silence, such as consumer equipment power supply, car audio system, etc.
- Low-voltage operation possible, with wide operating voltage range (2.2 to 14.0V)
- Low saturation output (Upper + lower saturation voltage :  $V_{Osat}$  (total) = 1.1V<sub>typ</sub>,  $I_O$  = 100mA)
  - : High coil efficiency with low current drain. Additionally, IC itself generates only small heat.
- Built-in lock protection and automatic reset circuits
- Built-in FG & 1/2FG outputs
- Built-in Hall bias ( $V_{HB}$  = 1.5V)
- Thermal protection circuit
  - : When the large current flows due to output short-circuit and the IC chip temperature exceeds 180°C, this protective circuit suppresses the drive current to prevent burn and damage to IC.
- Extra-small package (MSOP10)

## Specifications

**Absolute Maximum Ratings** at  $T_a = 25^\circ\text{C}$ 

Parameter	Symbol	Conditions	Ratings	Unit
Output voltage	$V_{CC}$ max		15	V
Allowable power dissipation	$P_d$ max	Mounted on a specified board*	400	mW
Output current	$I_{OUT}$ max		0.6	A
Output withstand voltage	$V_{OUT}$ max		15	V
RD/FG output pin output withstand voltage	$V_{RD/FG}$ max		15	V
RD/FG output current	$I_{RD/FG}$ max		10	mA
HB output current	$I_B$ max		10	mA
Operating temperature	$T_{opr}$		-40 to +85	°C
Storage temperature	$T_{stg}$		-40 to +150	°C

\* Mounted on a specified board : 20mm×10mm×0.8mm<sup>3</sup>, paper phenol

Caution 1) Absolute maximum ratings represent the value which cannot be exceeded for any length of time.

Caution 2) Even when the device is used within the range of absolute maximum ratings, as a result of continuous usage under high temperature, high current, high voltage, or drastic temperature change, the reliability of the IC may be degraded. Please contact us for the further details.

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

# LA6587FA

## Operating Conditions at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Supply voltage	V <sub>CC</sub>		2.2 to 14.0	V
Common-phase input voltage range of Hall input	V <sub>ICM</sub>		0 to V <sub>CC</sub> -1.5	V

## Electrical Characteristics at Ta = 25°C, V<sub>CC</sub> = 12V, unless especially specified.

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Circuit Current	I <sub>CC1</sub>	During drive (CT = L)	4	6	8	mA
	I <sub>CC2</sub>	During lock protection (CT = H)	3	4.5	6	mA
Lock detection capacitor charge current	I <sub>CT1</sub>		0.9	1.2	1.5	μA
Capacitor discharge current	I <sub>CT2</sub>		0.11	0.18	0.25	μA
Capacitor charge and discharge current ratio	R <sub>CT</sub>	RCD = I <sub>CT1</sub> /I <sub>CT2</sub>	5	6.5	8	-
CT charge voltage	V <sub>CT1</sub>		1.3	1.5	1.6	V
CT discharge voltage	V <sub>CT2</sub>		0.3	0.5	0.6	V
OUT output L saturation voltage	V <sub>OL</sub>	I <sub>O</sub> = 200mA		0.25	0.45	V
OUT output H saturation voltage	V <sub>OH</sub>	I <sub>O</sub> = 200mA		1.0	1.2	V
Hall input sensitivity	V <sub>HN</sub>	Zero peak value (including offset and hysteresis)		7	15	mV
FG/1/2FG output pin L voltage	V <sub>FG</sub>	I <sub>FG</sub> = 5mA		0.15	0.3	V
FG/1/2FG output pin leak current	I <sub>FGL</sub>	V <sub>FG</sub> = 15V		1	30	μA

## Truth Table

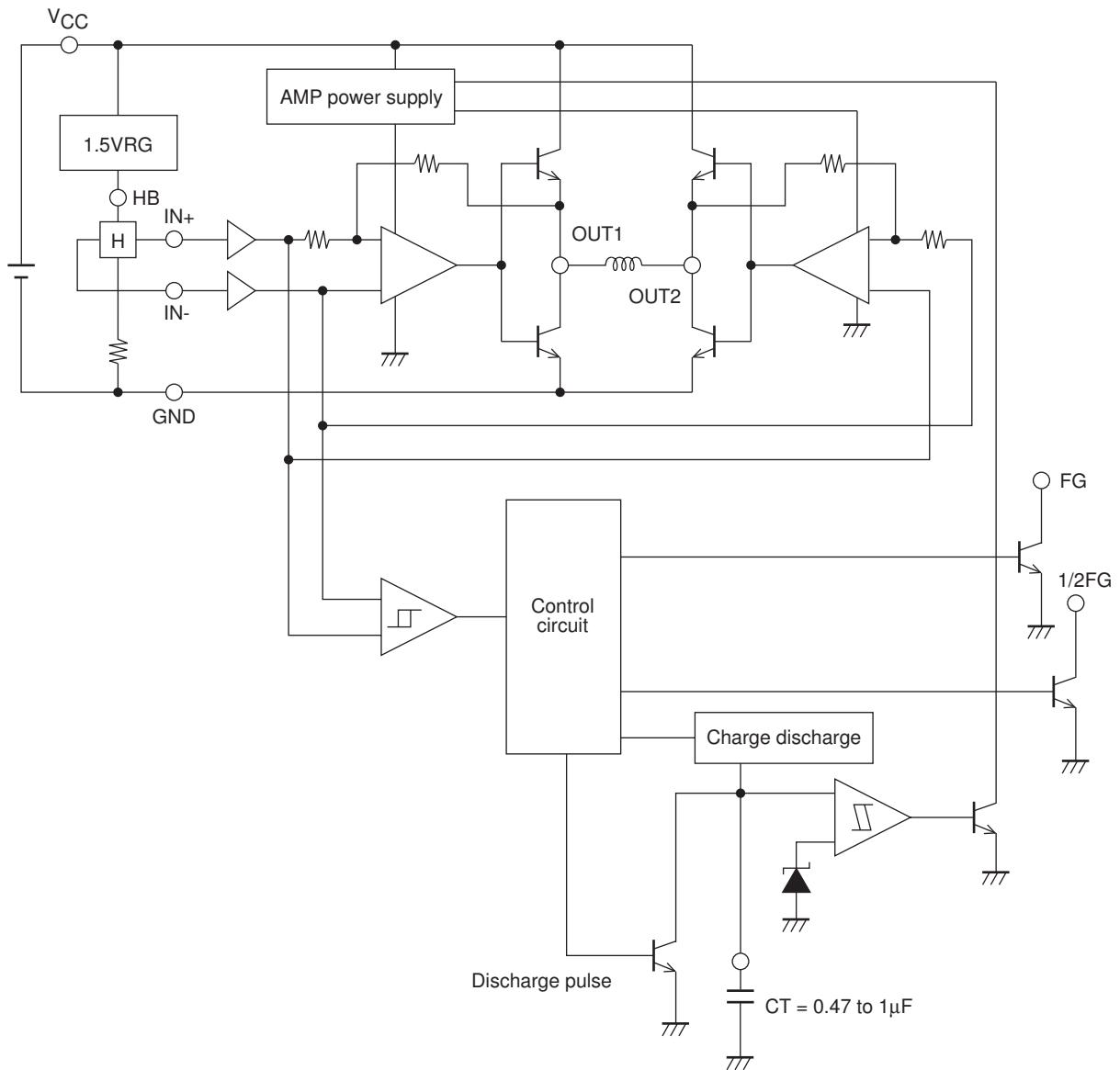
IN-	IN+	CT	OUT1	OUT2	FG	RD	Mode
H	L	L	H	L	L	*	During rotation
L	H		L	H	H		
-	-	H	off	off	-	-	During overheat protection

\* 1/2FG provides the output equivalent to the divided FG output.

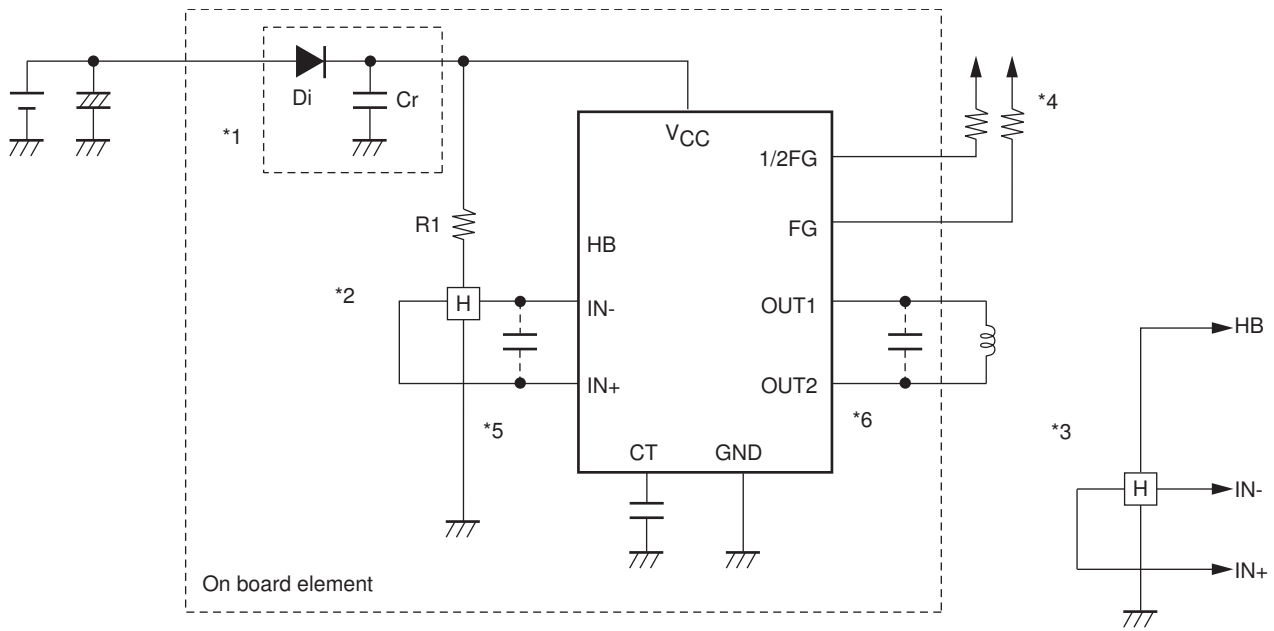


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## Block Diagram



Sample Application Circuit



- \*1 : When the breakdown protective DI at reverse connection is to be used, it is necessary to insert the capacitor Cr to secure the regenerative current route. Similarly, Cr must be provided to enhance the reliability when there is no capacitor near the fan power line.
- \*2 : To obtain Hall bias from V<sub>CC</sub>, carry out 1V<sub>CC</sub> bias as shown in the figure. Linear driving is made through voltage control of the coil by amplifying the Hall output. When the Hall element output is large, the startup performance and efficiency are improved. Adjustment of the Hall element can reduce the noise further.
- \*3 : To obtain Hall bias from the HB pin, carry out constant-voltage bias at about 1.5V, which enables the Hall element to generate the stable Hall output satisfactory in temperature characteristics.
- \*4 : Keep this open when not using.
- \*5 : When the wiring from the Hall output to IC Hall input is long, noise may be carried through the wiring. In this case, insert the capacitor as shown in the figure.

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