



ON Semiconductor®

<http://onsemi.com>

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 1k Ω -360k Ω , 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 : $V_{O\text{sat}}$ (total) = 1.1V_{typ}, 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 (Micro10)

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}		-30 to +90	°C
Storage temperature	T_{stg}		-55 to +150	°C

* Mounted on a specified board : 20mm \times 10mm \times 0.8mm³, 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 $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Supply voltage	V_{CC}		2.2 to 14.0	V
Common-phase input voltage range of Hall input	V_{ICM}		0 to $V_{CC}-1.5$	V

Electrical Characteristics at $T_a = 25^\circ\text{C}$, $V_{CC} = 12\text{V}$, unless especially specified.

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

Truth Table

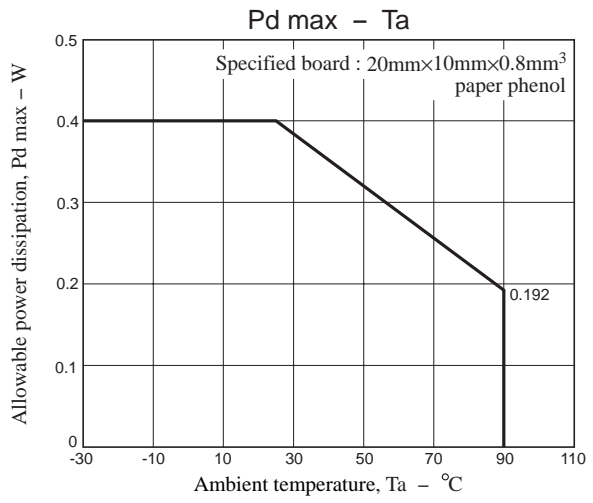
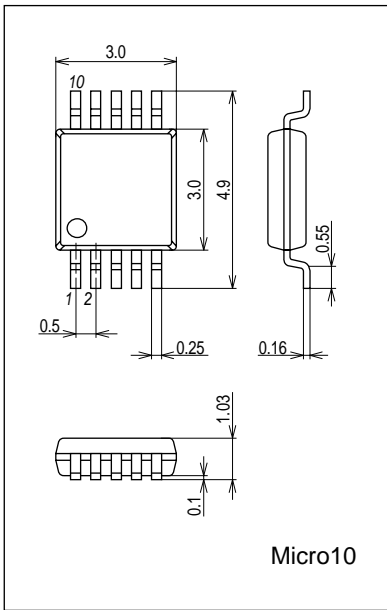
IN-	IN+	CT	OUT1	OUT2	FG	1/2FG	Mode
H	L	L	H	L	L	*	During rotation
L	H		L	H	H		
-	-	H	off	off	-	-	During overheat protection

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

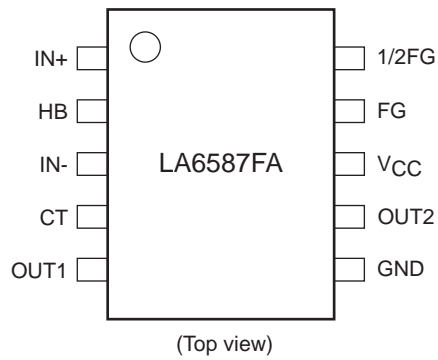
LA6587FA

Package Dimensions

unit : mm (typ)
3428

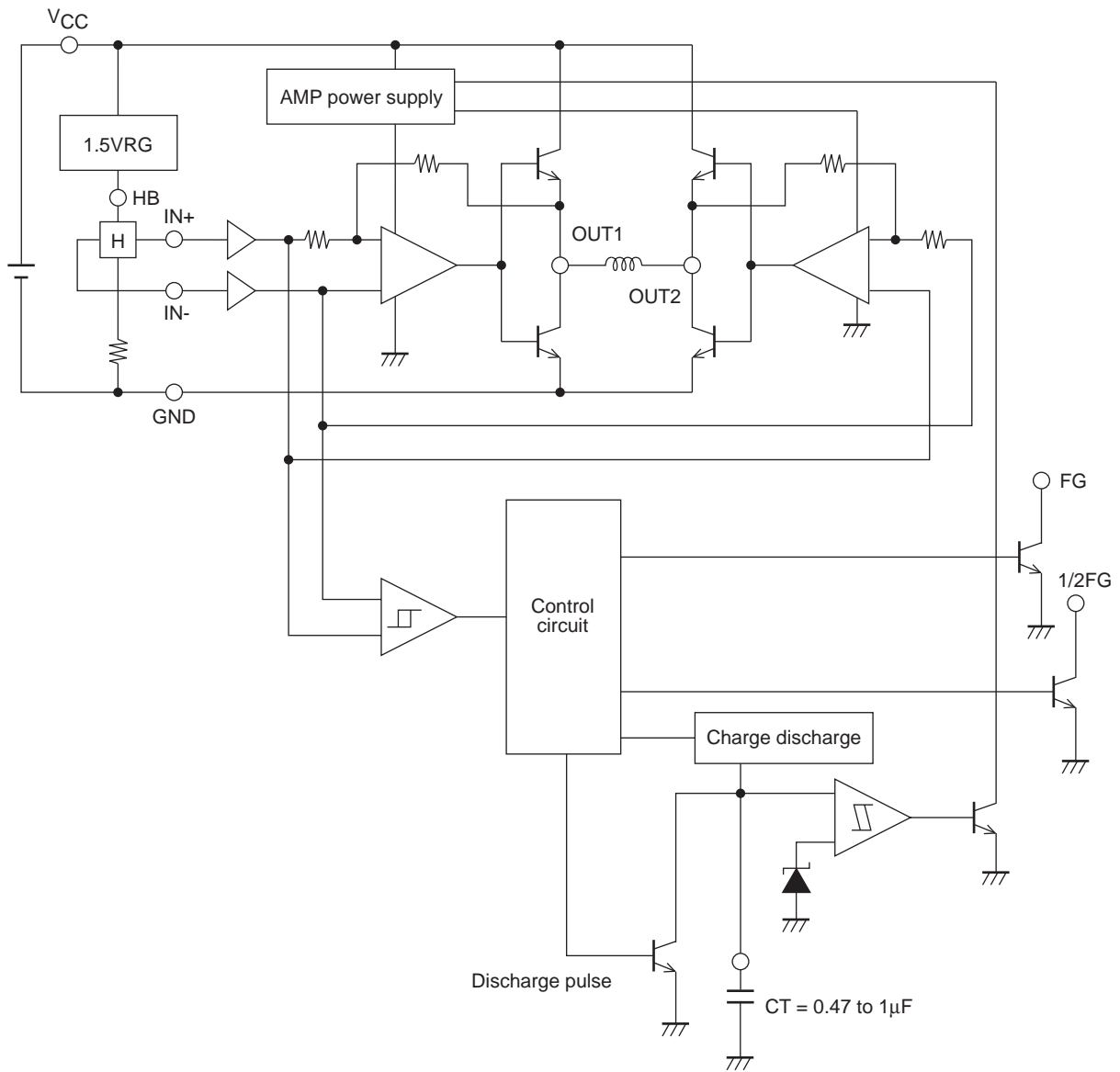


Pin Assignment

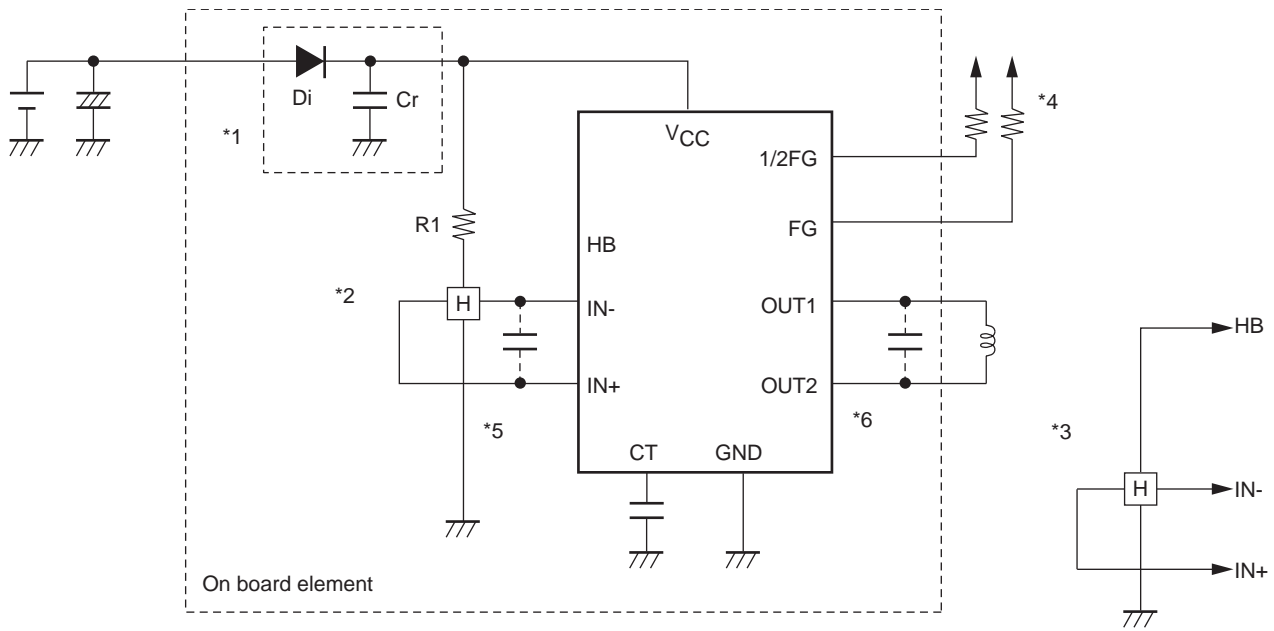


LA6587FA

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_{CC} , carry out $1V_{CC}$ 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.

ON Semiconductor and the ON logo are registered trademarks of Semiconductor Components Industries, LLC (SCILLC). SCILLC owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of SCILLC's product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. SCILLC reserves the right to make changes without further notice to any products herein. SCILLC makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does SCILLC assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. "Typical" parameters which may be provided in SCILLC data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. SCILLC does not convey any license under its patent rights nor the rights of others. SCILLC products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the SCILLC product could create a situation where personal injury or death may occur. Should Buyer purchase or use SCILLC products for any such unintended or unauthorized application, Buyer shall indemnify and hold SCILLC and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that SCILLC was negligent regarding the design or manufacture of the part. SCILLC is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.