Ordering number : EN6518A

SANYO Semiconductors
DATA SHEET

LA6538T — Monolithic Linear IC
Single-Phase Full-Wave Fan Motor Driver

Overview

The LA6538T is optimal for use as a fan motor driver in equipment, such as notebook personal computers and electronic game units, that requires miniaturization and low noise levels. This device achieves highly efficient single-phase bipolar fan motor drive by providing a low saturation voltage BTL output.

Functions

- BTL output single-phase full-wave linear drive (gain resistance: 180 to 500 kΩ, 360×)
  - Since this device generates no switching noise, it is optimal for fan drive in audio equipment, electronic games, and notebook personal computers.
- Supports low-voltage operation and features a wide usable voltage range (V_{CC} = 2.5 to 9.5V).
- Low saturation voltage output (Upper side + lower side saturation voltage: V_O sat (total) = 0.2V (typ), I_O = 100mA)
  - This device achieves a high coil efficiency for low current drain, and generates minimal heat in the IC itself.
- Constant-voltage Hall bias output.
  - The Hall element is regulated at 2.1V, and the device provides a stable Hall output with excellent temperature characteristics.
- FG output
  - The LA6538T provides a speed detection output (an open-collector output).
- Built-in thermal protection circuit
  - This circuit limits the drive current to prevent damage to or destruction of the IC when the IC chip temperature exceeds 180°C due to excessive output current caused by load shorting or other problem.
- Ultraminiature package (MSOP8: $3.0 \times 4.9 \times 0.93mm^3$)
  - Allows the circuit board to be miniaturized and a large heat sink to be used.

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60607 MS IM / 83000 RM(OT) B8-5218 No.6518-1/7

Reference materials:
T package (MSOP8) series fan motor drivers
LB1964T: 3 and 5V operation, low saturation voltage switching single-phase bipolar drive, FG output
LB11963T: 5 and 12V operation, switching single-phase bipolar drive, restart circuit, lock detection, 1/2 FG output
LB11964T: 5 and 12V operation, switching single-phase bipolar drive, restart circuit, lock detection, FG output

Specifications

Absolute Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V_{CC} max		10	V
OUT pin output current	I_{OUT} max		0.3	A
OUT pin output voltage handling	V_{OUT} max		9.5	V
FG output voltage handling	V_{FG} max		10	V
FG output current	I_{FG} max		5	mA
Allowable power dissipation	Pd max	Mounted on the specified printed circuit board*	400	mW
Operating temperature	Topr		-20 to +90	°C
Storage temperature	Tstg		-55 to +150	°C

* Specified printed circuit board: 20.0×10.0×0.8 mm^3, paper phenolic board, wiring density: 20%.

Recommended Operating Conditions at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Supply voltage	V_{CC}		2.5 to 9.5	V
Hall input common-mode input voltage range	V_{ICM}		0.9 to V_{CC} -1	V

Electrical Characteristics at Ta = 25°C, V_{CC} = 5V

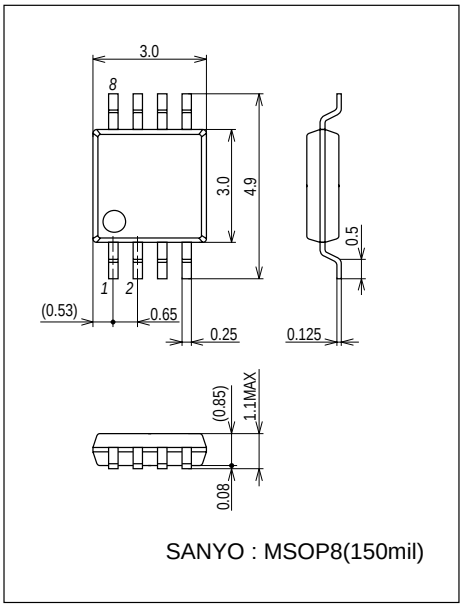
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Circuit current	I_{CC}	IN^- = 2.6V, IN^+ = 2.4V, R_L = ∞		10	15	mA
OUT pin output low-level voltage	V_{OL}	I_O = 100mA		0.1	0.2	V
OUT pin output high-level voltage	V_{OH}	I_O = 100mA		0.1	0.2	V
Hall bias voltage	V_{HB}	R_H = 360Ω + 91Ω	1.9	2.1	2.3	V
Hall amplifier gain	VG		47	50	53	dB
Hall amplifier input resistance	V_{INR}		400	500	620	Ω
FG output low-level voltage	V_{FG}	I_{FG} = 3mA		0.2	0.3	V
FG output leakage current	I_{FGL}	V_{FG} = 7V			30	μA
Thermal protection circuit	T-TSD	Design guarantee*	150	180	200	°C

* Design guarantee: Indicates a design target value. These parameters are not tested in the independent IC.

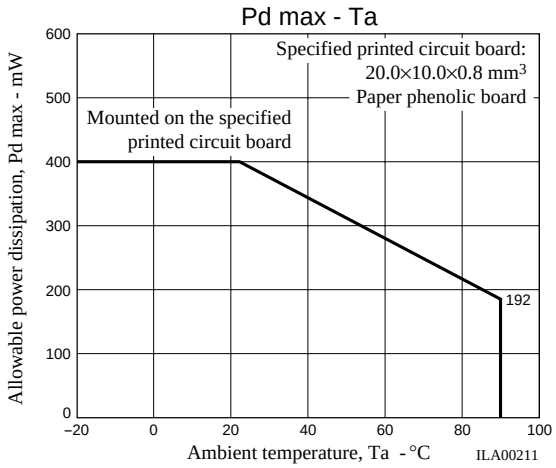
Package Dimensions

unit : mm (typ)

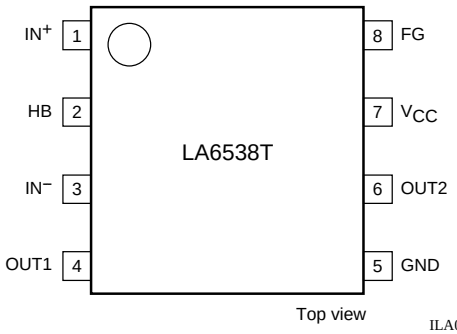
3245B



SANYO : MSOP8(150mil)



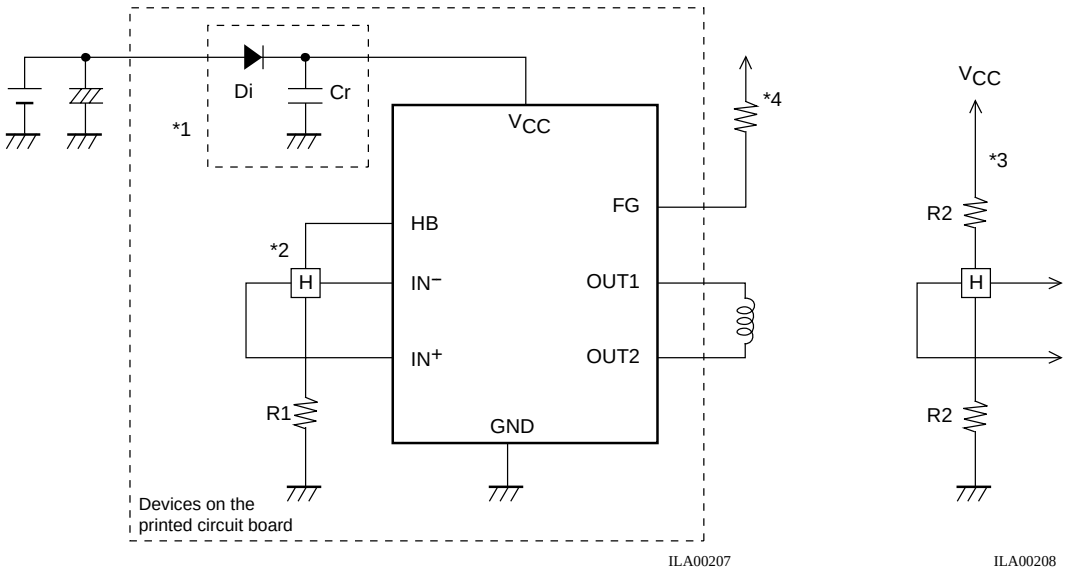
Pin Assignment



Truth Table

IN⁻	IN⁺	OUT1	OUT2	FG	Mode
H	L	H	L	L	Motor operating
L	H	L	H	off	
–	–	off	off	–	Thermal protection activated

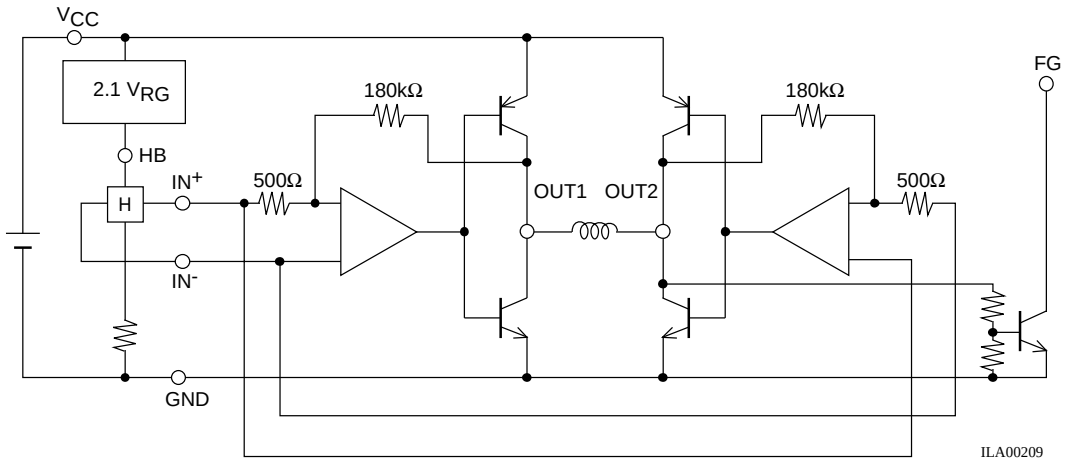
Sample Application Circuit



Note: 1. When the diode Di is used to prevent device destruction from reverse connection, the capacitor Cr must be inserted to assure a path for regenerative currents. Similarly, if there are no nearby capacitors on the fan power supply line, the capacitor Cr is also required to increase reliability.

2. The Hall element is biased at a constant voltage of approximately 2.1V from the HB pin. Thus the LA6538T provides a stable Hall output with excellent temperature characteristics. The resistor R1 adjusts the Hall output amplitude.
   The LA6538T implements linear drive by amplifying the Hall output and applying voltage control to the motor coils. Startup characteristics and efficiency are improved by using a higher Hall device output. However, the motor can be made to operate more quietly by adjusting the Hall device.
3. If the Hall bias is taken from V_{CC}, bias the Hall device at 1/2 V_{CC} as shown in the figure.
4. This pin must be left open if unused.

Block Diagram



Timing Chart