



SANYO Semiconductors

# DATA SHEET

## LA6581CL — Monolithic Linear IC Fan Motor Driver BTL Driver Single-Phase Full-Wave

### Overview

The LA6581CL is a low-saturation BTL output linear driving motor driver for single-phase bipolar fan motors. It features quite, low power, high efficiency drive that suppresses reactive current. It 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 with BTL output (gain resistance 500Ω to 284kΩ, 55dB) : Suitable for the equipment requiring silent operation, such as game equipment, CPU cooler, etc. because of its freedom from switching noise.
- Low-voltage operation possible, with wide operable voltage range (3 to 16V)
- Low saturation output (Upper + lower saturation voltage :  $V_{O\text{sat}}$  (total) = 0.3V typ,  $I_O = 100\text{mA}$ ) : High coil efficiency with low current drain. IC itself does not generate much heat.
- High impedance of Hall input pin
- FG output (rotation speed detection output : open collector output)
- Heat protection circuit : When the large current flows because of output short-circuit, raising the IC chip temperature above 180°C, the heat protection circuit suppresses the drive current, preventing IC burn and breakdown.
- Ultraminiature package (ECSP2828-10 : 2.8mm×2.8mm×0.8mm typ) : Small substrate while allowing larger blades.

■ Any and all SANYO Semiconductor Co.,Ltd. products described or contained herein are, with regard to "standard application", intended for the use as general electronics equipment (home appliances, AV equipment, communication device, office equipment, industrial equipment etc.). The products mentioned herein shall not be intended for use for any "special application" (medical equipment whose purpose is to sustain life, aerospace instrument, nuclear control device, burning appliances, transportation machine, traffic signal system, safety equipment etc.) that shall require extremely high level of reliability and can directly threaten human lives in case of failure or malfunction of the product or may cause harm to human bodies, nor shall they grant any guarantee thereof. If you should intend to use our products for applications outside the standard applications of our customer who is considering such use and/or outside the scope of our intended standard applications, please consult with us prior to the intended use. If there is no consultation or inquiry before the intended use, our customer shall be solely responsible for the use.

■ Specifications of any and all SANYO Semiconductor Co.,Ltd. products described or contained herein stipulate the performance, characteristics, and functions of the described products in the independent state, and are not guarantees of the performance, characteristics, and functions of the described products as mounted in the customer's products or equipment. To verify symptoms and states that cannot be evaluated in an independent device, the customer should always evaluate and test devices mounted in the customer's products or equipment.

# LA6581CL

## Specifications

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

Parameter	Symbol	Conditions	Ratings	Unit
Output voltage	$V_{CC}$ max		18	V
Output current	$I_{OUT}$ max	*1	0.36	A
	$I_{OUT}$ max	$T < 200\text{ms}$	0.50	A
Output withstand voltage	$V_{OUT}$ max		18	V
FG output withstand	$V_{FG}$ max		18	V
FG output current	$I_{FG}$ max		5	mA
Allowable power dissipation	$P_d$ max	Mounted on a specified board *2	450	mW
Operating temperature	$T_{opr}$		-30 to +100	$^\circ\text{C}$
Storage temperature	$T_{stg}$		-55 to +150	$^\circ\text{C}$

\*1: This specifies the starting current.  $T_j = 150^\circ\text{C}$  max must not be exceeded.

\*2: Specified board: 20.0mm × 10.1mm × 0.8mm, Paper phenol.

### Recommended Operating Ratings at $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Supply voltage	$V_{CC}$		2.2 to 16	V
Common-phase input voltage range of Hall input	$V_{ICM}$		0.3 to $V_{CC}-1.5$	V

### Electrical Characteristics at $T_a = 25^\circ\text{C}$ , $V_{CC} = 12.0\text{V}$ , unless especially specified.

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Circuit current	$I_{CC}$	$IN^- = 5.8\text{V}$ , $IN^+ = 6.0\text{V}$ , $R_L = \infty$		14	19	mA
OUT output low voltage	$V_{OL}$	$I_O = 100\text{mA}$		0.1	0.2	V
OUT output high voltage	$V_{OH}$	$I_O = 100\text{mA}$		0.1	0.2	V
Hall bias voltage	$V_{HB}$	$I_{HB} = 5\text{mA}$	1.85	1.95	2.05	V
Hall amplifier gain	$V_g$		52	55	58	dB
Hall amplifier input current	$V_{INR}$		-10	-2	10	$\mu\text{A}$
Input offset voltage	$V_{OFST}$			3	6	mV
FG output low voltage	$V_{FG}$	$I_{FG} = 3\text{mA}$		0.2	0.3	V
FG output leakage current	$I_{FGL}$	$V_{FG} = 7\text{V}$			30	$\mu\text{A}$
Thermal protection circuit	$T_h$	* Design guarantee	150	180	200	$^\circ\text{C}$

\* Design guarantee : Design target. Measurement with a single unit not made.

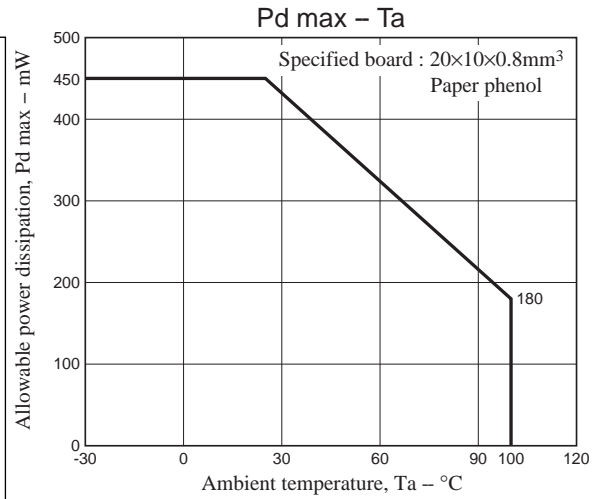
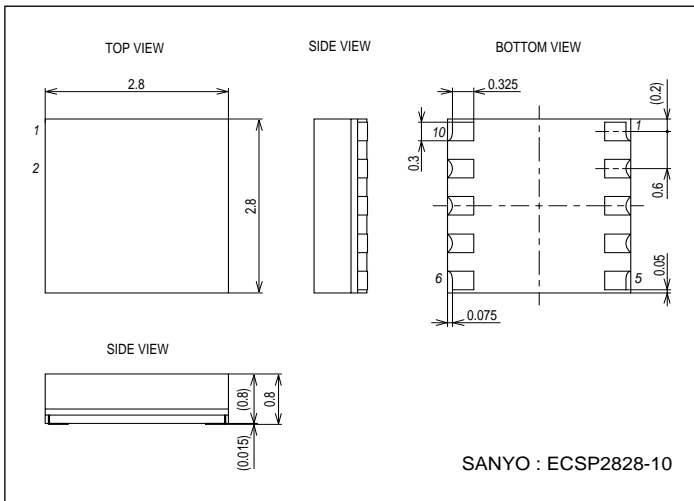
### Truth Table

$IN^-$	$IN^+$	OUT1	OUT2	FG	Mode
H	L	H	L	L	During rotation
L	H	L	H	off	
-	-	off	off	-	During overheat protection

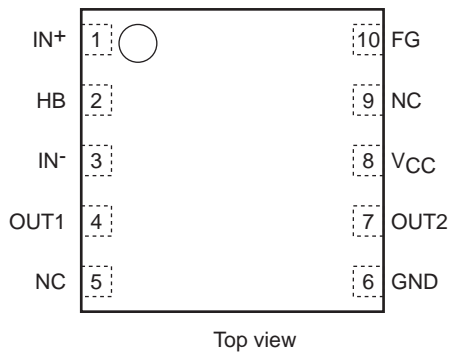
# LA6581CL

## Package Dimensions

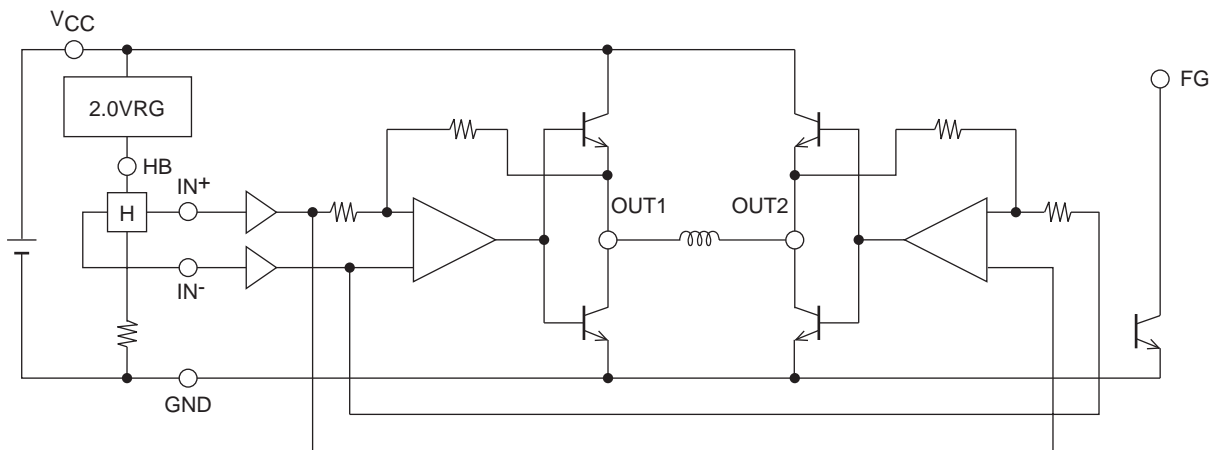
unit : mm (typ)  
3301A



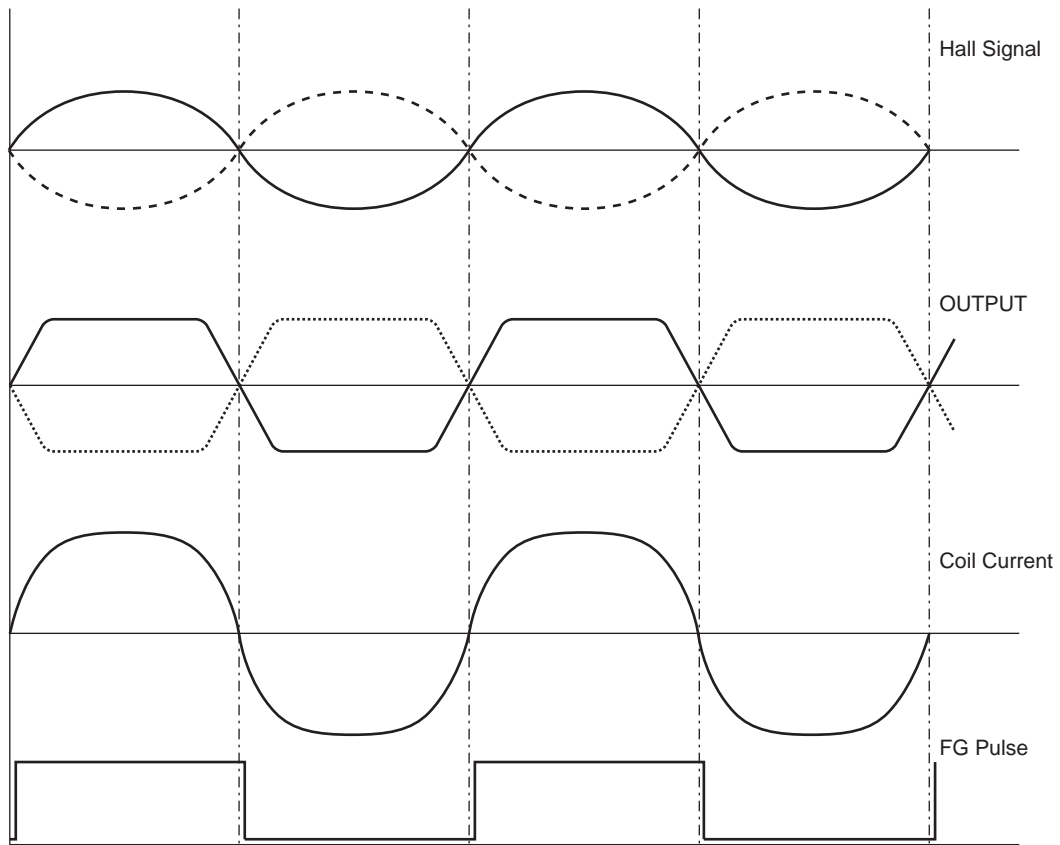
## Pin Assignment



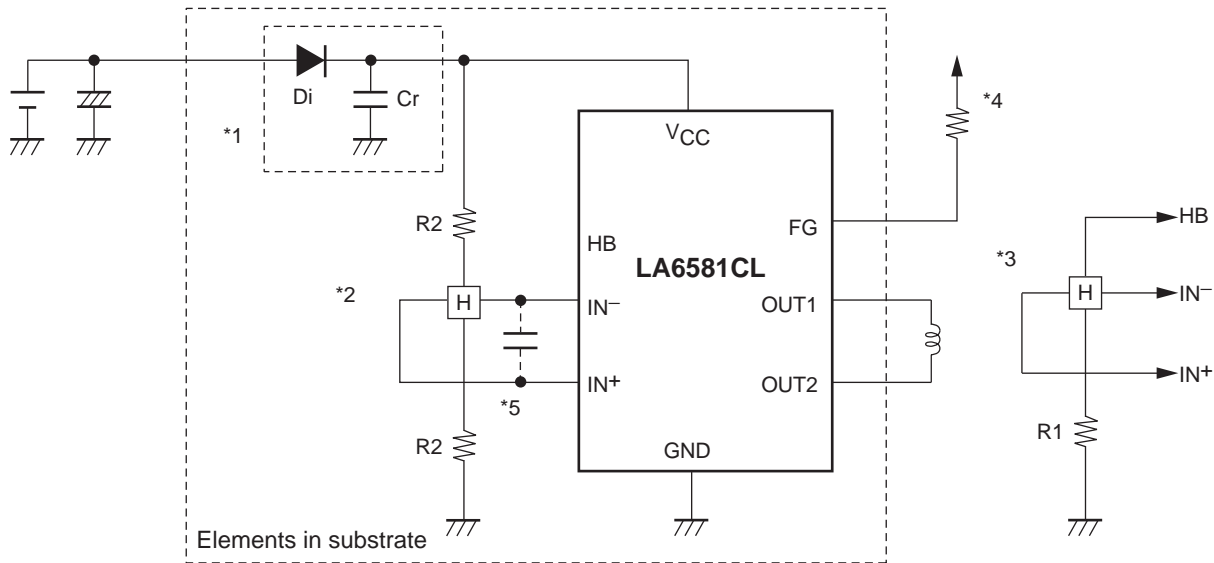
## Block Diagram



Timing Chart



Application Circuit Example



- \*1 : When Di to prevent breakdown in case of reverse connection is used, it is necessary to insert a capacitor Cr to secure the regenerative current route. Similarly, Cr is necessary to enhance the reliability when there is no capacitor near the fan power line.
- \*2 : To obtain Hall bias from VCC, carry out  $1/2 \times V_{CC}$  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 : When the Hall bias is taken from the HB pin, constant-voltage bias is made with about 2.0V. Therefore, the Hall element can provide the output satisfactory in temperature characteristics. Adjustment of the Hall output amplitude is made with R1. (When  $V_{CC} = 12V$ , the step \*2 above proves advantageous for IC heat generation.)
- \*4 : Keep this open when not used.
- \*5 : When the wiring from the Hall output to IC Hall input is long, noise may be carried through the wiring.

- SANYO Semiconductor Co.,Ltd. assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all SANYO Semiconductor Co.,Ltd. products described or contained herein.
- SANYO Semiconductor Co.,Ltd. strives to supply high-quality high-reliability products, however, any and all semiconductor products fail or malfunction with some probability. It is possible that these probabilistic failures or malfunction could give rise to accidents or events that could endanger human lives, trouble that could give rise to smoke or fire, or accidents that could cause damage to other property. When designing equipment, adopt safety measures so that these kinds of accidents or events cannot occur. Such measures include but are not limited to protective circuits and error prevention circuits for safe design, redundant design, and structural design.
- In the event that any or all SANYO Semiconductor Co.,Ltd. products described or contained herein are controlled under any of applicable local export control laws and regulations, such products may require the export license from the authorities concerned in accordance with the above law.
- No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying and recording, or any information storage or retrieval system, or otherwise, without the prior written consent of SANYO Semiconductor Co.,Ltd.
- Any and all information described or contained herein are subject to change without notice due to product/technology improvement, etc. When designing equipment, refer to the "Delivery Specification" for the SANYO Semiconductor Co.,Ltd. product that you intend to use.
- Information (including circuit diagrams and circuit parameters) herein is for example only; it is not guaranteed for volume production.
- Upon using the technical information or products described herein, neither warranty nor license shall be granted with regard to intellectual property rights or any other rights of SANYO Semiconductor Co.,Ltd. or any third party. SANYO Semiconductor Co.,Ltd. shall not be liable for any claim or suits with regard to a third party's intellectual property rights which has resulted from the use of the technical information and products mentioned above.

This catalog provides information as of March, 2009. Specifications and information herein are subject to change without notice.