



SANYO Semiconductors

## DATA SHEET

# LA6541D

## Monolithic Linear IC For Compact Discs 4-Channel Bridge Driver

### Overview

The LA6541D is a 4-channel bridge (BTL) driver for CD players.

### Features

- 4-channel bridge (BTL) power amplifier.
- $I_O$  max 700mA.
- With mute circuit (Affects all amplifier outputs, Amp 1 to Amp 8).  
(When the mute voltage is low, the outputs turn off ; when the mute voltage is high, the outputs turn on).
- 5.0V regulator built-in (Uses external PNP transistor).
- Reset circuit built-in (The reset output delay time can be adjusted through an external capacitor).

### Specifications

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

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	$V_{CC}$ max		14	V
Maximum input voltage	$V_{IN}$		13	V
Mute pin voltage	$V_{Mute}$		13	V
Allowable power dissipation	$P_d$ max	Mounted on the specified board *	2.5	W
Operating temperature	$T_{opr}$		-20 to +75	$^\circ\text{C}$
Storage temperature	$T_{stg}$		-55 to +150	$^\circ\text{C}$

\* Specified board : 76.2mm × 114.3mm × 1.5mm, glass epoxy board

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

Parameter	Symbol	Conditions	Ratings	Unit
Operating voltage	$V_{CC}$		5.6 to 13	V
Reset output source current	$I_{ORH}$		0 to 200	$\mu\text{A}$
Reset output sink current	$I_{ORL}$		0 to 2	mA

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# LA6541D

**Electrical Characteristics** at  $T_a = 25^\circ\text{C}$ ,  $V_{CC} = 8.0\text{V}$ ,  $V_{REF} = 4\text{V}$

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
No-load current drain	$I_{CC1}$	When all amplifier outputs are on (Mute high)		20	40	mA
	$I_{CC2}$	When all amplifier outputs are off (Mute low)		15	35	mA
Output offset voltage	$V_{OF1}$	Amplifiers 1 to 2 ( $V_{O1}$ to $V_{O2}$ ), Amplifiers 3 to 4 ( $V_{O3}$ to $V_{O4}$ )	-50		+50	mV
	$V_{OF2}$	Amplifiers 5 to 6 ( $V_{O5}$ to $V_{O6}$ ), Amplifiers 7 to 8 ( $V_{O7}$ to $V_{O8}$ )	-50		+50	mV
Buffer input voltage range	$V_{BIN}$		1.5		$V_{CC}-1.5$	V
Input voltage range	$V_{IN}$		1.0		$V_{CC}-1.5$	V
Output source voltage	$V_{O1}$	Note 1, when $R_L = 8.0\Omega$	5.0	5.6		V
Output sink voltage	$V_{O2}$	Note 2, when $R_L = 8.0\Omega$		1.8	2.4	V
Closed-circuit voltage gain	$V_G$	Between bridge amplifier		9		dB
Slew rate	$SR$			0.15		V/ $\mu\text{s}$
Mute on voltage	$V_{Mute}$	Note 3		1.2		V
<b>Power supply</b> (with 2SK632K connected externally)						
Output voltage	$V_{OUT1}$	$I_O = 200\text{mA}$	4.75	5.0	5.25	V
Line regulation	$\Delta V_{OLN1}$	$5.6 \leq V_{IN1} \leq 12\text{V}$		20	100	mV
Load regulation	$\Delta V_{OLD1}$	$5\text{mA} \leq I_O \leq 200\text{mA}$		50	150	mV
<b>Reset</b>						
High reset output voltage	$V_{ORH}$	$I_{ORH} = 200\mu\text{A}$ , Cd pin open	4.73	4.98	5.23	V
Low reset output voltage	$V_{ORL}$	$I_{SRL} = 2\text{mA}$ , Cd is shorted to GND		100	200	mV
Reset threshold voltage	$V_{RT}$	Note 4		4.3		V
Reset hysteresis voltage	$V_{hys}$	Note 5	40	100	200	mV
Reset output delay time	$t_d$	$C_d = 0.1\mu\text{F}$		10		ms

Note : 1. Source voltage to ground when an  $8\Omega$  load is connected between bridge amplifier outputs.

2. Sink voltage to ground when an  $8\Omega$  load is connected between bridge amplifier outputs.

3. When the mute signal is high, all amplifier outputs turn on, and when low, all amplifier outputs turn off. When the mute signal is low, amplifier output is undefined.

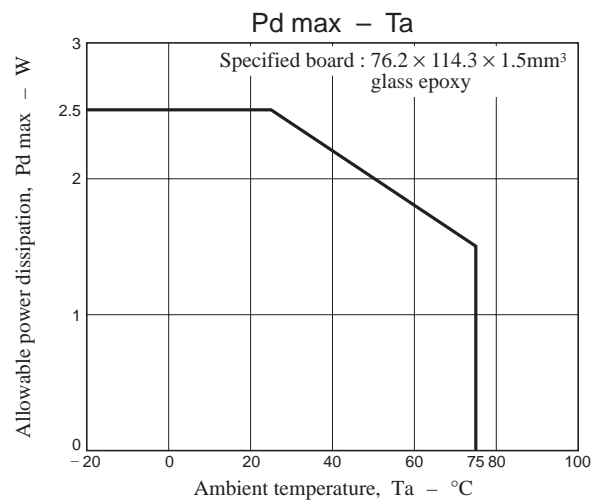
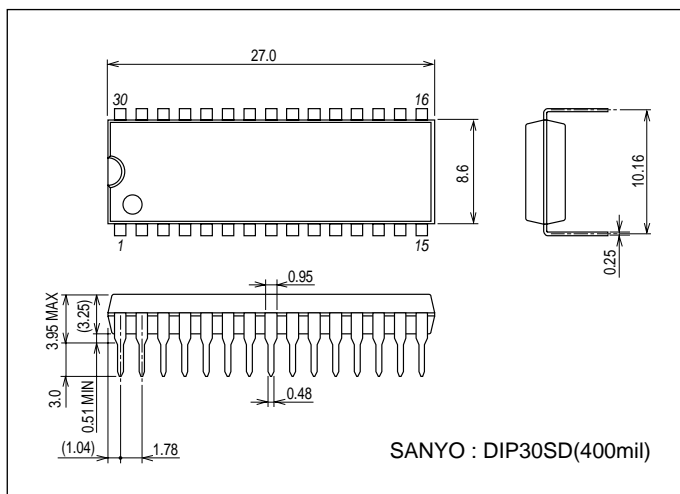
4. 5V supply voltage when the reset output goes low.

5. Potential difference from the 5V supply voltage when the reset output goes low and when it goes high.

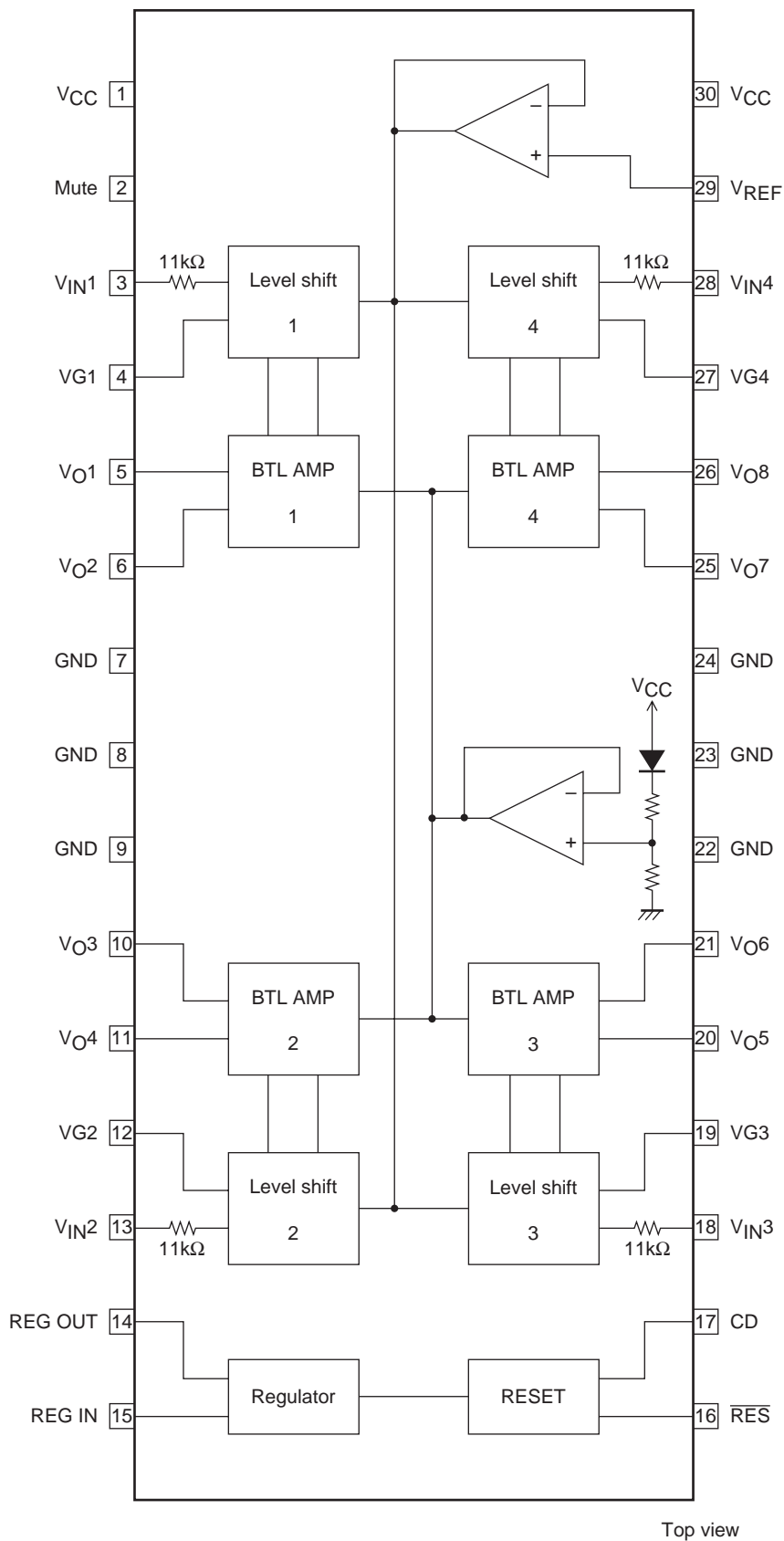
## Package Dimensions

unit : mm (typ)

3196A



# Pin Assignment and Block Diagram



## LA6541D

### Pin Functions

Pin No.	Pin Name	Description
1	V <sub>CC</sub>	Power supply (shorted with pin 30)
2	Mute	ON/OFF control for all BTL amplifier outputs
3	V <sub>IN1</sub>	BTL amplifier 1 input
4	VG1	BTL amplifier 1 input pin (for gain control)
5	V <sub>O1</sub>	BTL amplifier 1 output (non-inverting side)
6	V <sub>O2</sub>	BTL amplifier 1 output (inverting side)
7	GND	GND (minimum electric potential)
8	GND	GND (minimum electric potential)
9	GND	GND (minimum electric potential)
10	V <sub>O3</sub>	BTL amplifier 2 output pin (inverting side)
11	V <sub>O4</sub>	BTL amplifier 2 output pin (non-inverting side)
12	VG2	BTL amplifier 2 input pin (for gain control)
13	V <sub>IN2</sub>	BTL amplifier 2 input
14	REG OUT	Connection for collector of external transistor (PNP) ; 5V supply output
15	REG IN	Connection for base of external transistor (PNP)
16	$\overline{\text{RES}}$	Reset output
17	CD	Reset output delay time setting (with capacitor)
18	V <sub>IN3</sub>	BTL amplifier 3 input
19	VG3	BTL amplifier 3 input (for gain control)
20	V <sub>O5</sub>	BTL amplifier 3 output (non-inverting side)
21	V <sub>O6</sub>	BTL amplifier 3 output (inverting side)
22	GND	GND (minimum electric potential)
23	GND	GND (minimum electric potential)
24	GND	GND (minimum electric potential)
25	V <sub>O7</sub>	BTL amplifier 4 output (inverting side)
26	V <sub>O8</sub>	BTL amplifier 4 outputn (non-inverting side)
27	VG4	BTL amplifier 4 input (for gain control)
28	V <sub>IN4</sub>	BTL amplifier 4 input
29	V <sub>REF</sub>	Reference voltage input for level shift circuit
30	V <sub>CC</sub>	Power supply (shorted with pin 1)

# LA6541D

## Pin Description

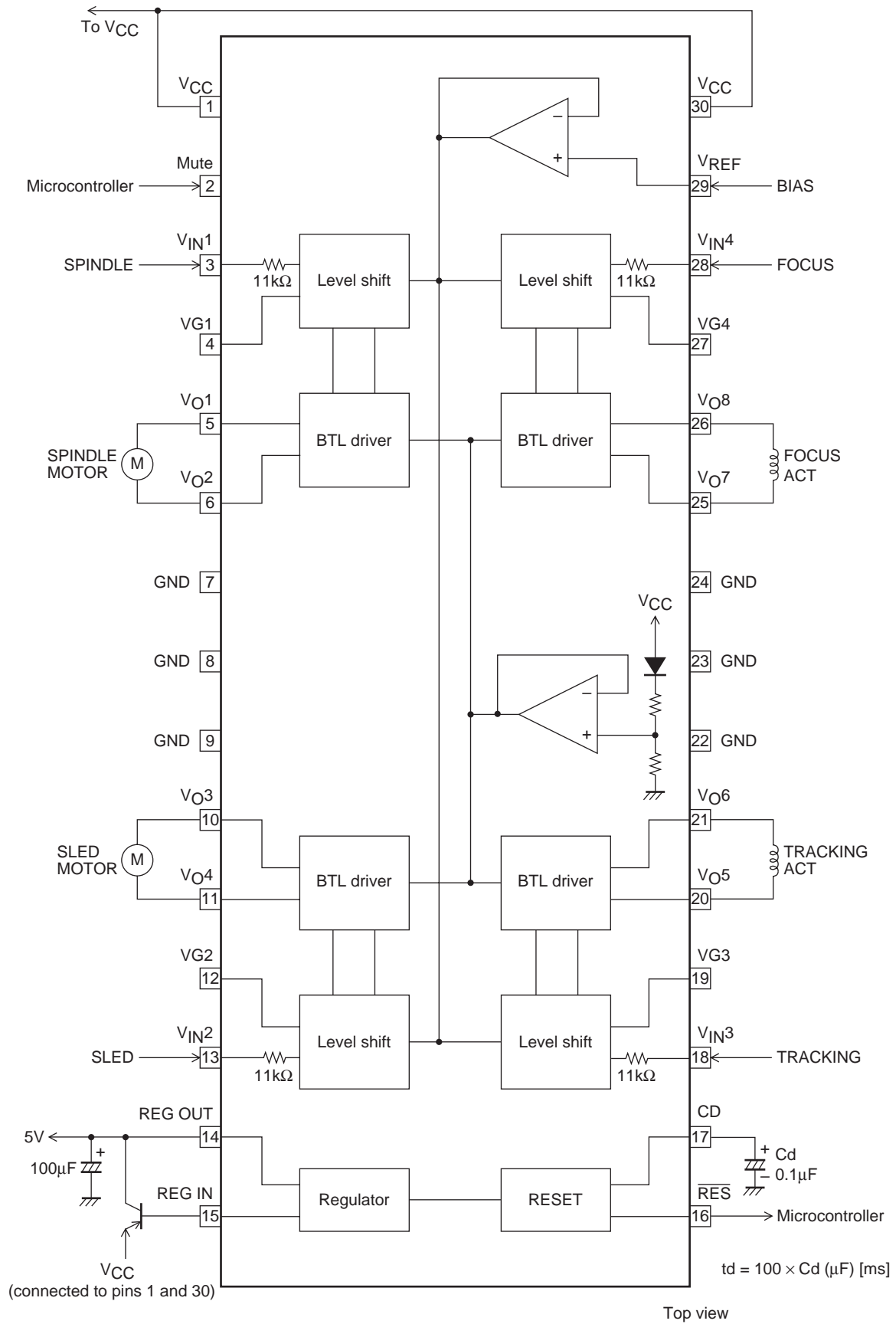
Pin No.	Pin Name	Function	Description	Equivalent circuit
3 13 18 28 4 12 19 27	V <sub>IN1</sub> V <sub>IN2</sub> V <sub>IN3</sub> V <sub>IN4</sub> V <sub>G1</sub> V <sub>G2</sub> V <sub>G3</sub> V <sub>G4</sub>	Input	Each input pins	
5, 6 10, 11 20, 21 25, 26	V <sub>O1</sub> , V <sub>O2</sub> V <sub>O3</sub> , V <sub>O4</sub> V <sub>O5</sub> , V <sub>O6</sub> V <sub>O7</sub> , V <sub>O8</sub>	Output	Each output pins	
2	Mute	Mute	Output ON/OFF	

## Truth Table

Input	MUTE	CH1		CH2		CH3		CH4	
		V <sub>O1</sub> (Amp 1)	V <sub>O2</sub> (Amp 2)	V <sub>O3</sub> (Amp 3)	V <sub>O4</sub> (Amp 4)	V <sub>O5</sub> (Amp 5)	V <sub>O6</sub> (Amp 6)	V <sub>O7</sub> (Amp 7)	V <sub>O8</sub> (Amp 8)
H	H	H	L	L	H	H	L	L	H
	L	-	-	-	-	-	-	-	-
L	H	L	H	H	L	L	H	H	L
	L	-	-	-	-	-	-	-	-

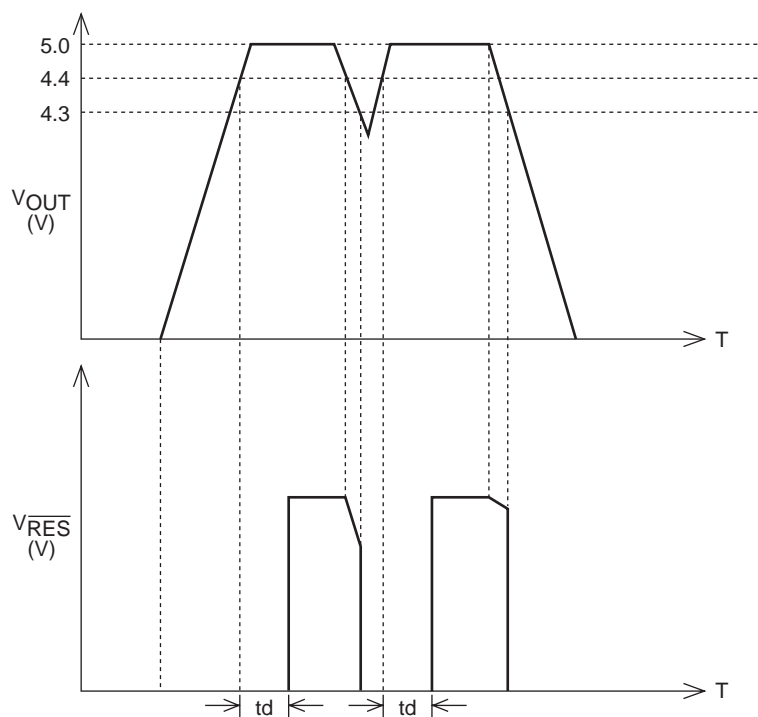
\* The "-" symbol means "undefined."

# Sample Application Circuit



Note : Use a delay capacitor (Cd) whose capacitance does not change much according to the temperature.

## Reset Operation



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