Ordering number : EN7817A

LA6565

Monolithic Linear IC

For CD and DVD players
5-channel Driver (BTL:4ch,H-bridge:1ch)

ON Semiconductor®

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Overview

The LA6565 is a 4-channel BTL plus 1-channel H-bridge actuator driver developed for use in CD and DVD drives. The BTL driver channels 1 and 2 include built-in operational amplifiers allowing the LA6565 to support a wide range of applications.

Functions

- Five power amplifier channels on a single chip (Bridge connection (BTL): 4-channels, H-bridge: 1-channel)
- I_O max: 1A
- Built-in level shifters (except for the H bridge channel)
- Muting circuits (output on/off, two systems)
  (The muting circuits operate for the BTL amplifiers. They do not apply to the H-bridge or regulator circuits.)
- Built-in regulator (Uses an external PNP-transistor and is set with an external resistor.)
- Output voltage setting function (loading driver)
- Built-in independent operational amplifiers
- Thermal shutdown circuit

Specifications

Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V_{CC} max		14	V
Maximum output current	I_O max		1	A
Maximum input voltage	V_{INB}		13	V
MUTE pin voltage	V_{MUTE}		13	V
Allowable power dissipation	Pd max	Independent IC	0.8	W
		Mounted on a specified board *	2	W
Operating temperature	Topr		-40 to +85	°C
Storage temperature	Tstg		-55 to +150	°C

* Specified board: 114.3mm × 76.1mm × 1.6mm, glass epoxy board.

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.

Recommended Operating Conditions at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Supply voltage	V_{CC}		5.6 to 13	V

Electrical Characteristics at Ta = 25°C, $V_{CC}1 = V_{CC}2 = 8V$, VREF = 2.5V

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Overall						
Quiescent current when o	I_{CC}-ON	BTL amplifier output on, loading block off *1		30	50	mA
Quiescent current when off	I_{CC}-OFF	All outputs off *1		10	15	mA
Thermal shutdown circuit operating temperature	TSD	*7	150	175	200	°C
VREF Amplifier						
VREF amplifier offset voltage	VREF-OFFSET		-10		+10	mV
VREF input voltage range	VREF-IN		1		V_{CC}-1.5	V
VREF-OUT output current	I-VREF-OUT			1		mA
Operational Amplifier (Independent)						
Input voltage range	V_{IN}(OP)		0		V_{CC}-1.5	V
Output current (sink)	SINK(OP)		2			mA
Output current (source)	SOURCE(OP)		300	500		µA
Output offset voltage	V_{OFF}(OP)		-10		+10	mV
Residual current (sink)	V_{CE}-SINK(OP)	I_O(sink side) = 1mA			0.6	V
BTL Amplifier Block (Channels 1 to 4)						
Output offset voltage	V_{OFF}	The voltage difference between each channel outputs *2, *3	-50		+50	mV
Input voltage range	V_{IN}	Input voltage range of the input operational amplifiers	0		V_{CC}-1.5	V
Output voltage	V_O	I_O = 0.5A, the voltage between V_O^+ and V_O^- in each channel	5.7	6.2		V
Closed circuit voltage gain	VG	The gain from the input to the output with the input amplifier set to 0dB*2, *3	7.2	8	9	times
Slew rate SR	SR	For the independent amplifier. Times 2 when between outputs.*7		0.5		V/µs
Muting on voltage	V_{MUTE}-ON	The output on voltage, for each mute function *4	2.5			V
Muting off voltage	V_{MUTE}-OFF	The output off voltage, for each mute function *4			0.5	V
Input Amplifier Block (Channels 1 and 2)						
Input voltage range	V_{IN}-OP		0		V_{CC}-1.5	V
Output current (sink)	SINK-OP		2			mA
Output current (source)	SOURCE-OP	*5	300	500		µA
Output offset voltage	V_{OFF}-OP		-10		+10	mV
Loading Block (Channel 5, H bridge circuit)						
Output voltage	V_O-LOAD	For forward/reverse operation, I_O = 0.5A, VCONT = V_{CC}*	5.7	6.5		V
Braking output saturation voltage	V_{CE}-BREAK	The output voltage during braking *6			0.3	V
Low-level input voltage	V_{IN}-L				1	V
High-level input voltage	V_{IN}-H		2			V
Power Supply Block (Uses an external 2SB632K PNP-transistor)						
Power supply output	V_{OUT}	I_O = 200mA	1.260	1.285	1.310	V
REG-IN sink current	REG-IN-SINK	External PNP-transistor base current	5	10		mA
Line regulation	ΔV_OLN	6V ≤ V_{CC} ≤ 12V, I_O = 200mA		10	100	mV
Load regulation	ΔV_OLD	5mA ≤ I_O ≤ 200mA		10	100	mV

*1: The total current dissipation for V_{CC}P1, V_{CC}P2, and V_{CC}S with no load.

*2: The input amplifier is a buffer amplifier.

*3: The voltage difference between the two sides of the load (12Ω).

*4: When the MUTE pin is high, the output will be on, and when low, the output will be off (high-impedance state).

*5: The input operational amplifier source is constant current. Since the 11kΩ resistor between this and the next stage functions as the load, the input operational amplifier gain must be set carefully.

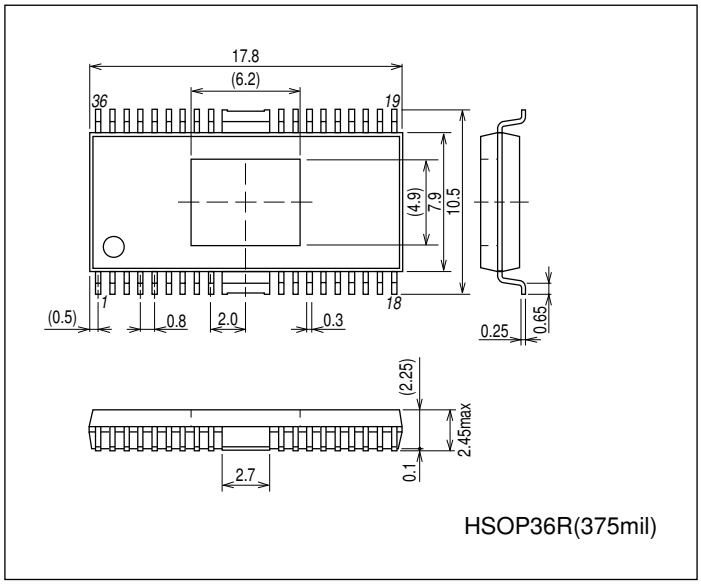
*6: The braking operation is a short (to ground) braking operation. The sink side output is on at this time.

*7: Design guarantee.

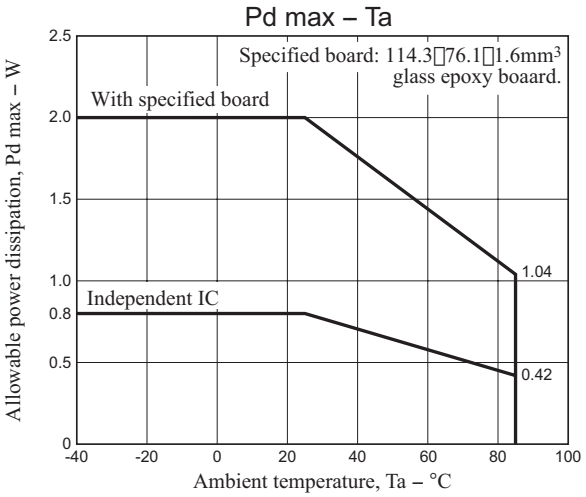
Package Dimensions

unit : mm (typ)

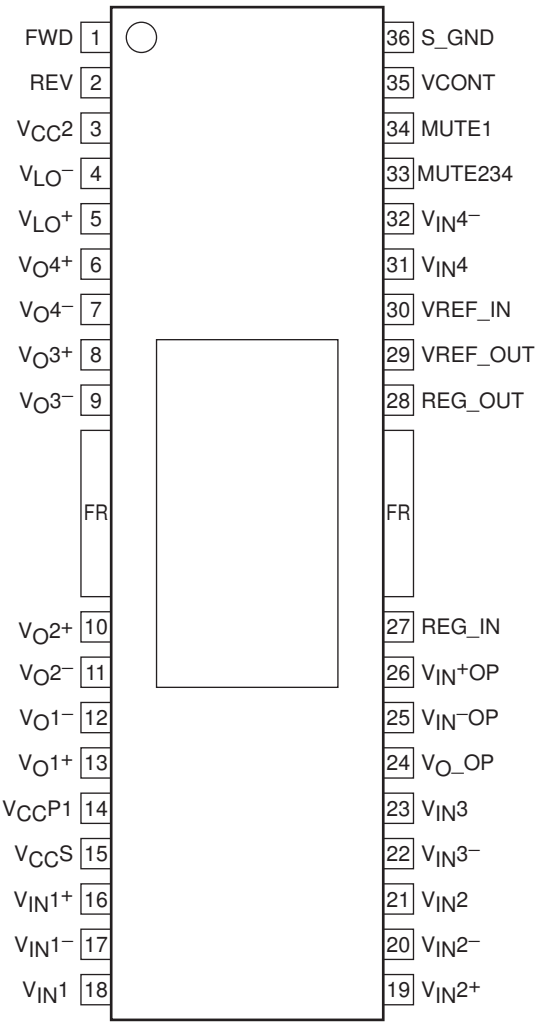
3251



HSOP36R(375mil)

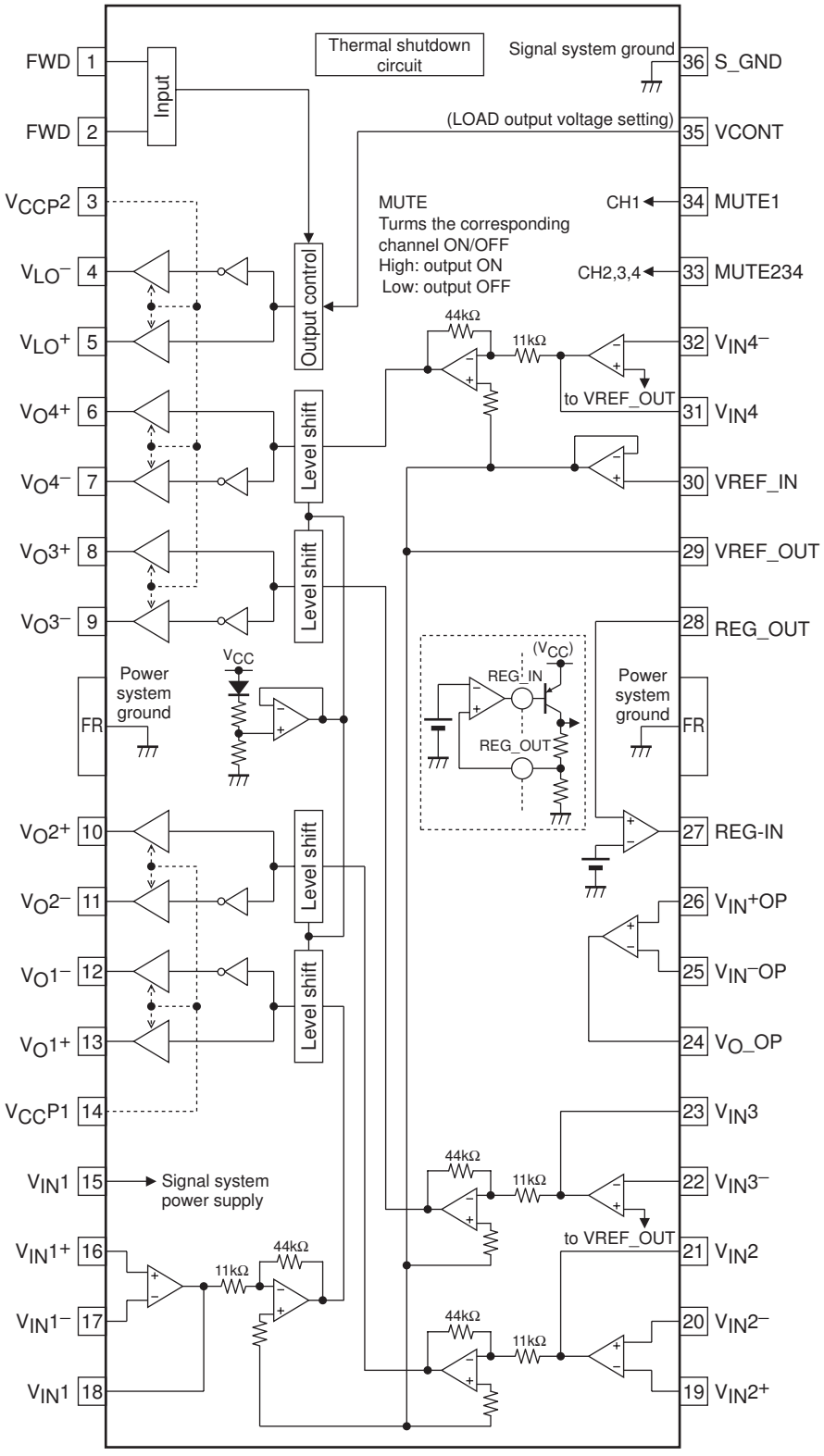


Pin Assignment



Top View

Block Diagram

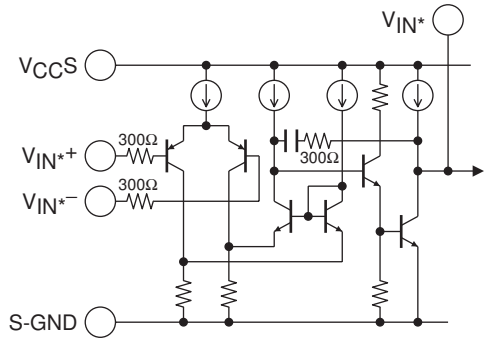
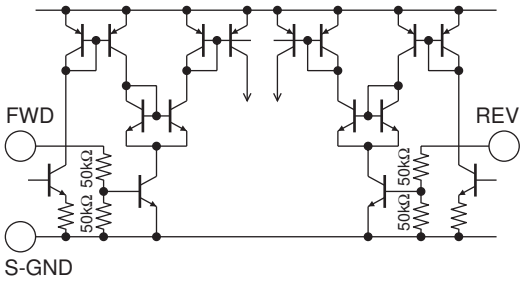
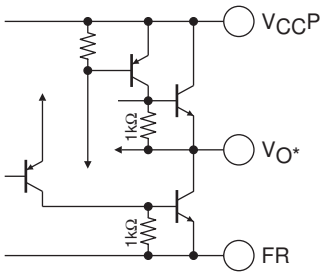
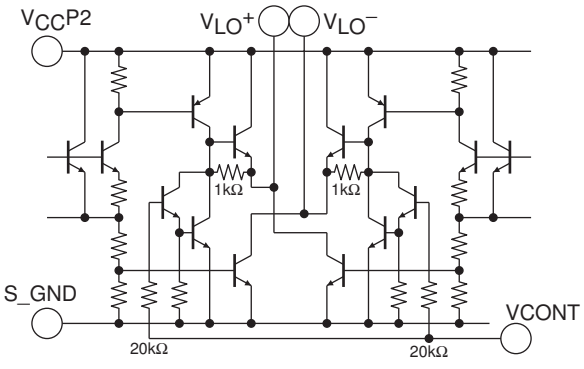
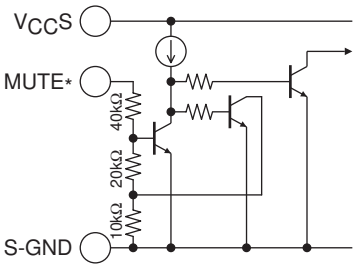


Pin Function

Pin No.	Pin name	Pin function
1	FWD	Loading output direction switching (FWD). Loading system logic input.
2	REV	Loading output direction switching (REV). Loading system logic input.
3	$V_{CC}2$	Channels 3, 4, and loading power stage power supply.
4	V_{LO}^{-}	Loading output (–)
5	V_{LO}^{+}	Loading output (+)
6	$V_{O}4^{+}$	Channel 4 output (+)
7	$V_{O}4^{-}$	Channel 4 output (–)
8	$V_{O}3^{+}$	Channel 3 output (+)
9	$V_{O}3^{-}$	Channel 3 output (–)
10	$V_{O}2^{+}$	Channel 2 output (+)
11	$V_{O}2^{-}$	Channel 2 output (–)
12	$V_{O}1^{-}$	Channel 1 output (–)
13	$V_{O}1^{+}$	Channel 1 output (+)
14	$V_{CC}P1$	Channels 1 and 2 power stage power supply.
15	$V_{CC}S$	Signal system power supply.
16	$V_{IN}1^{+}$	Channel 1 input. Input operational amplifier + input.
17	$V_{IN}1^{-}$	Channel 1 input. Input operational amplifier – input.
18	$V_{IN}1$	Channel 1 input. Input operational amplifier output.
19	$V_{IN}2^{+}$	Channel 2 input. Input operational amplifier + input.
20	$V_{IN}2^{-}$	Channel 2 input. Input operational amplifier – input.
21	$V_{IN}2$	Channel 2 input. Input operational amplifier output.
22	$V_{IN}3^{-}$	Channel 3 input. Input operational amplifier – input.
23	$V_{IN}3$	Channel 3 input. Input operational amplifier output.
24	V_{O}_OP	Operational amplifier output.
25	V_{IN}^{-}OP	Operational amplifier – input
26	V_{IN}^{+}OP	Operational amplifier + input
27	REG_IN	Regulator error amplifier output. Connect this pin to the base of the external PNP-transistor.
28	REG_OUT	Regulator error amplifier input (+).
29	VREF_OUT	VREF amplifier (voltage follower) output.
30	VREF_IN	VREF input. Apply the external reference voltage to this pin.
31	$V_{IN}4$	Channel 4 input. Input operational amplifier output.
32	$V_{IN}4^{-}$	Channel 4 input. Input operational amplifier – input.
33	MUTE234	Controls the on/off state of channels 2, 3, and 4.
34	MUTE1	Channel 1 output on/off control
35	VCONT	Loading block output high-level voltage setting.
36	S_GND	Signal system ground.

* center frame (FR) becomes GND for the power system, Set this to the minimum potential together with S_GND (signal system ground).

Pin Description

Pin No.	Pin name	Function	Description	Equivalent circuit
16 17 18 19 20 21 22 23 32 31 26 25 24	$V_{IN}1^+$ $V_{IN}1^-$ $V_{IN}1$ $V_{IN}2^+$ $V_{IN}2^-$ $V_{IN}2$ $V_{IN}3^-$ $V_{IN}3$ $V_{IN}4^-$ $V_{IN}4$ V_{IN}^+OP V_{IN}^-OP V_O_OP	Input (CH1 to 4)	Inputs (channels 1 to 4 and the independent operational amplifier)	
1 2	FWD REV	Input (H-bridge)	Logic inputs. The IC is set to one of four modes, forward, reverse, brake, and free running by the combination of high and low values applied to these pins.	
12 13 10 11 8 9 6 7	V_O1^+ V_O1^- V_O2^+ V_O2^- V_O3^+ V_O3^- V_O4^+ V_O4^-	Output (BTL-AMP)	Channel 1 to 4 outputs.	
4 5	V_{LO}^- V_{LO}^+	Output (H-bridge)	H-bridge (loading) output.	
35	VCONT	Input	Loading output setting.	
33 34	MUTE234 MUTE1	MUTE	BTL amplifier output ON/OFF state setting. High: output ON Low: output OFF	

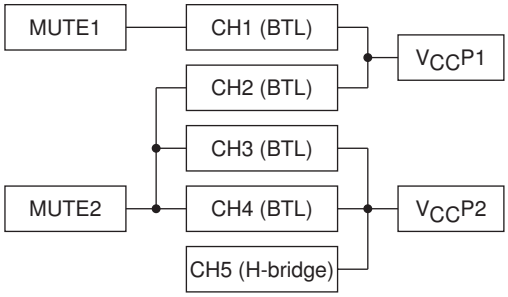
Truth Table (Loading (H bridge) block)

FWD	REV	V_{LO}^+	V_{LO}^-	Loading output
L	L	OFF	OFF	OFF *1
	H	H	L	Forward
H	L	L	H	Reverse
	H	L	L	Short-circuit braking *2

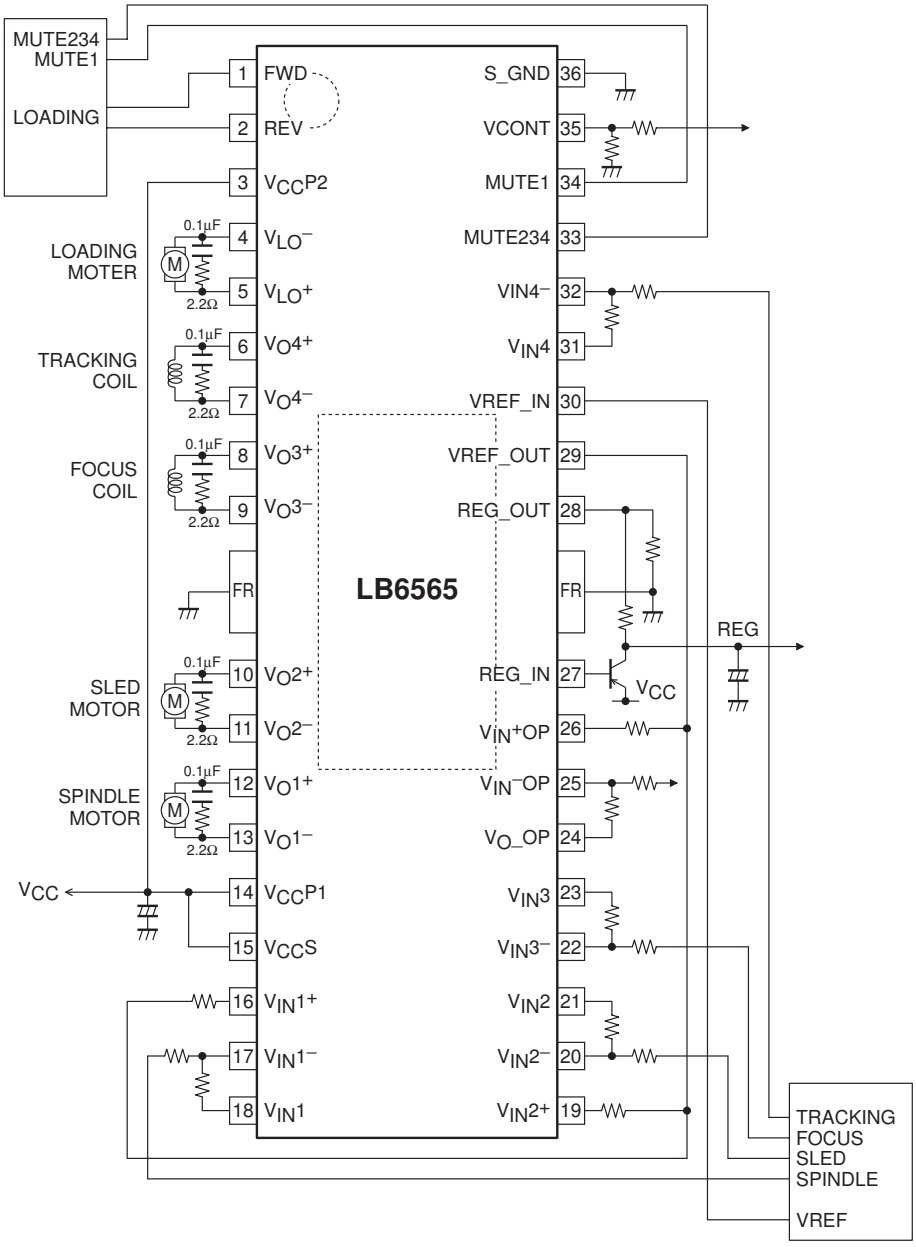
*1. The output goes to the high-impedance state.

*2. In braking mode, the sink side transistor is turned on (for short-circuit braking). The V_{LO}^+ and V_{LO}^- pins go to a level that is essentially the ground level.

Relationship between the MUTE pins and the power supply systems ($V_{CC}P^*$)



Application Circuit Example



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