5-CHANNEL MOTOR DRIVER IC AZ9259

General Description

The AZ9259 is a monolithic integrated circuit, and suitable for 5-channel motor driver which drives focus actuator, tracking actuator, sled motor, spindle motor and loading motor of VCD system.

This motor driver IC is available in standard HSOP-28 package.

Features

- 1 Phase, Full-wave, Linear DC Motor Driver
- Built-in TSD (Thermal Shutdown) Circuit
- Built-in 5V Regulator (with an External PNP Transistor)
- Built-in Mute Circuit
- Built-in Loading Motor Speed Control Circuit
- Wide Operating Supply Voltage Range: 6V to 13.2V

Applications

- Video Compact Disk Player (VCD)
- Compact Disk Player (CDP)
- Other Compact Disk Media

HSOP-28

Figure 1. Package Type of AZ9259

Pin Configuration

M Package
(HSOP-28)

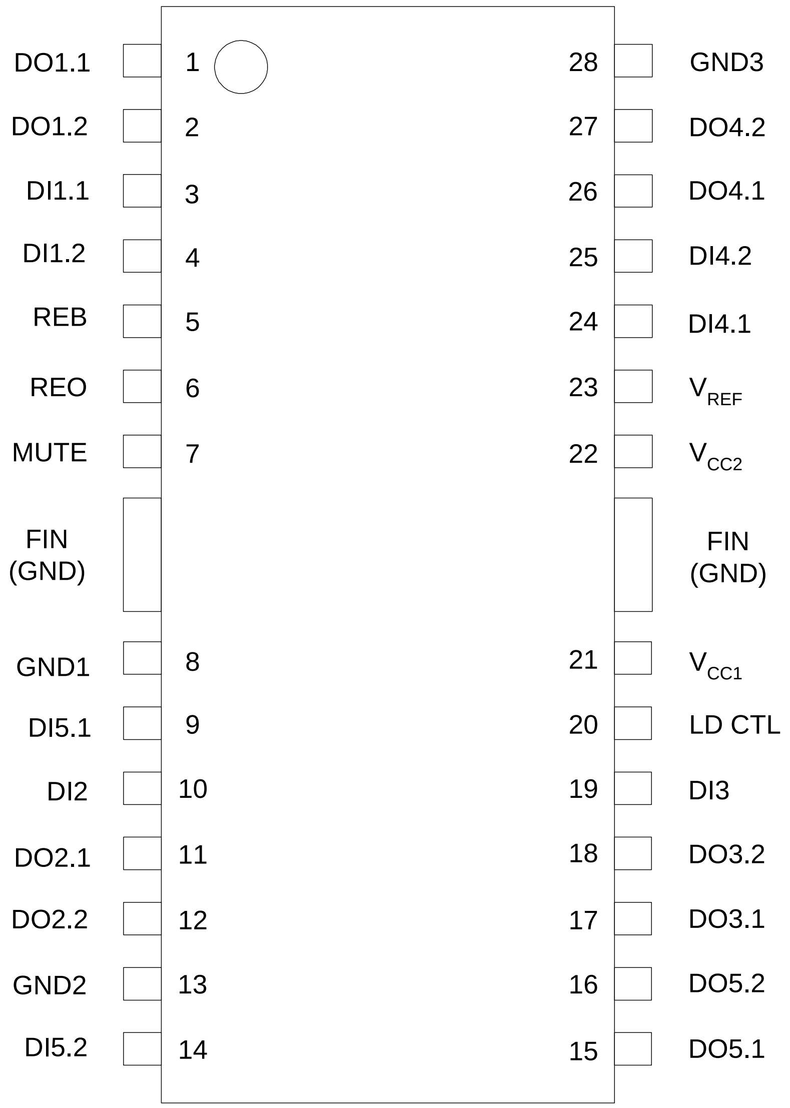


Figure 2. Pin Configuration of AZ9259 (Top View)

Pin Description

Pin Number	Pin Name	Function
1	DO1.1	Focus output (-)
2	DO1.2	Focus output (+)
3	DI1.1	Focus input 1
4	DI1.2	Focus input 2 (Adjustable)
5	REB	Regulator base
6	REO	Regulator output, 5V
7	MUTE	Mute
8	GND1	Ground 1
9	DI5.1	Loading input 1
10	DI2	Spindle input 2
11	DO2.1	Spindle output (+)
12	DO2.2	Spindle output (-)
13	GND2	Ground 2
14	DI5.2	Loading Input 2
15	DO5.1	Loading output 1 (+)
16	DO5.2	Loading output 2 (-)
17	DO3.1	Sled output (-)
18	DO3.2	Sled output (+)
19	DI3	Sled input
20	LD CTL	Loading motor speed control
21	V_{CC1}	Supply voltage 1
22	V_{CC2}	Supply voltage 2
23	V_{REF}	2.5V bias
24	DI4.1	Tracking input 1 (Adjustable)
25	DI4.2	Tracking input 2
26	DO4.1	Tracking output 1 (+)
27	DO4.2	Tracking output 2 (-)
28	GND3	Ground 3

Functional Block Diagram

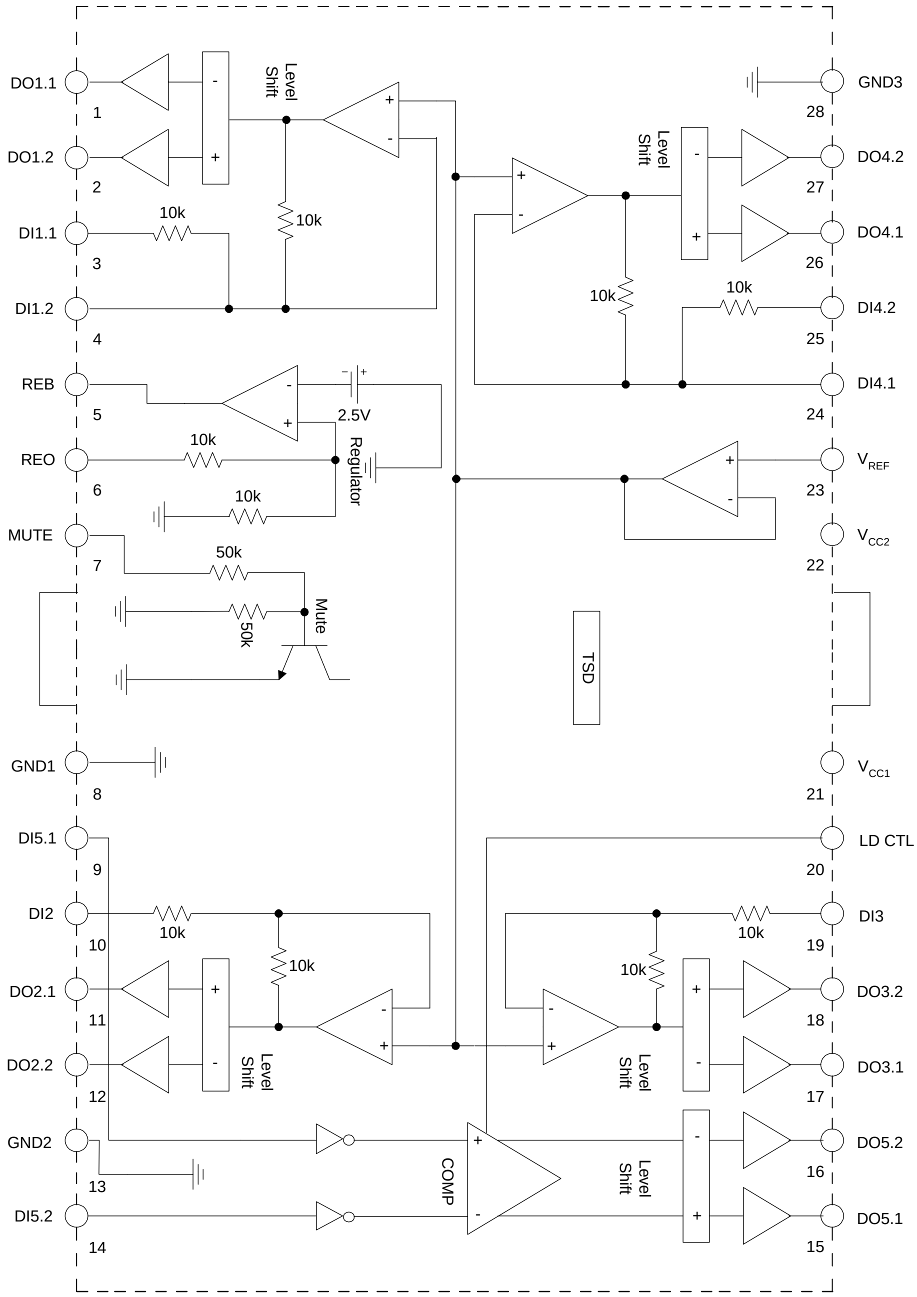
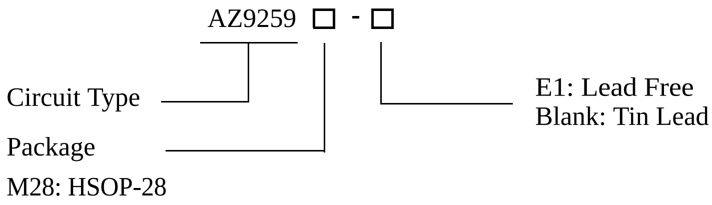


Figure 3. Functional Block Diagram of AZ9259

Ordering Information



Package	Temperature Range	Part Number		Marking ID		Packing Type
		Tin Lead	Lead Free	Tin Lead	Lead Free	
HSOP-28	0 to 70^{o}C	AZ9259M28	AZ9259M28-E1	AZ9259M28	AZ9259M28-E1	Tube

BCD Semiconductor's Pb-free products, as designated with "E1" suffix in the part number, are RoHS compliant.

Absolute Maximum Ratings (Note 1)

Parameter	Symbol	Value	Unit
Supply Voltage	V_{CC}	18	V
Driver Output Current	I_O	1	A
Power Dissipation	P_D	1.7 (Note 2)	W
Storage Temperature Range	T_{STG}	-55 to 150	^{o}C

Note 1: Stresses greater than those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "Recommended Operating Conditions" is not implied. Exposure to "Absolute Maximum Ratings" for extended periods may affect device reliability.

Note 2: The Power dissipation is reduced by 13.6mW for each increase in T_A of 1^{o}C over 25^{o}C.

Recommended Operating Conditions

Parameter	Symbol	Min	Max	Unit
Supply Voltage	V_{CC}	6	13.2	V
Operating Temperature	T_A	0	70	^{o}C

Electrical Characteristics

(T_A=25°C, V_{CC}= 8V, R_L=8Ω, unless otherwise specified.)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Quiescent Circuit Current	I_{CC}	No load	2.5	5	10	mA
Mute-on Current	I_{MUTE}	Pin 7=GND		2.5	5	mA
Mute-on Voltage	V_{MON}				0.5	V
Mute-off Voltage	V_{MOFF}		2			V
Regulator Part						
Output Voltage	V_{REG}	I_L=100mA	4.7	5	5.3	V
Load Regulation	ΔV_{RL3}	I_L=0 to 200mA	-50	0	50	mV
Line Regulation	ΔV_{CC}	V_{CC}=6 to 13V, I_L=100mA	-20	0	80	mV
Driver Part (Except for Loading Motor Driver)						
Input Offset Voltage	V_{IO}		-15		15	mV
Output Offset Voltage1	V_{OO1}		-40		40	mV
Max Source Current 1	$I_{SOURCE1}$	R_L=8Ω → V_{CC}	0.25	0.7		A
Max Sink Current 1	I_{SINK1}	R_L=8Ω → GND	0.25	0.8		A
Max Output Voltage 3	V_{OM3}	V_{IN}=0.7V, V_{CC}=13V	8.5	8.8		V
Max Output Voltage 4	V_{OM4}	V_{CC}=13V	8.5	8.8		V
Closed-Loop Voltage Gain	A_{VF}	V_{CC}=13V	5	6.5	8	dB
Ripple Rejection Ratio	RR	V_{IN}=0.1V_{RMS}, f =120Hz	40	60		dB
Slew Rate	SR	V_{IN}=1V_{RMS}, f =120Hz, Square Wave	1	2		V/µs
Loading motor driver part (unless otherwise specified, V_{CTL}=opened)						
Output Voltage 1	V_{O1}	V_{PIN9}=5V, V_{PIN14}=0V, R_L=45Ω	2.5	3.6	3.8	V
Output Voltage 2	V_{O2}	V_{PIN9}=0V, V_{PIN14}=5V, R_L=45Ω	2.5	3.6	3.8	V
Output Voltage Regulation 1 (CTL)	V_{OCTL1}	V_{CTL}=3.5 to 4.5V, V_{PIN9}=5V, V_{PIN14}=0V, R_L=45Ω	0.5	1.2	1.5	V
Output Voltage Regulation 2 (CTL)	V_{OCTL2}	V_{CTL}=3.5 to 4.5V, V_{PIN9}=0V, V_{PIN14}=5V, R_L=45Ω	0.5	1.2	1.5	V
Load Regulator 1	ΔV_{RL1}	I_L=100 to 400 mA, V_{PIN9}=5V, V_{PIN14}=0V		100	700	mV
Load Regulator 2	ΔV_{RL2}	I_L=100 to 400 mA, V_{PIN9}=0V, V_{PIN14}=5V		100	700	mV
Output Offset Voltage 2	V_{OO2}	V_{PIN9}=5V, V_{PIN14}=5V	-40		40	mV
Output Offset Voltage 3	V_{OO3}	V_{PIN9}=0V, V_{PIN14}=0V	-40		40	mV

Equivalent Circuits

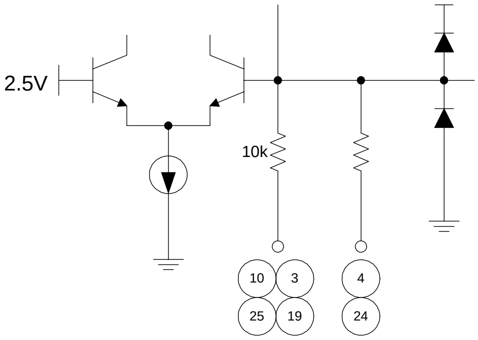


Figure 4. Driver Input
(Except for Loading Motor Driver)

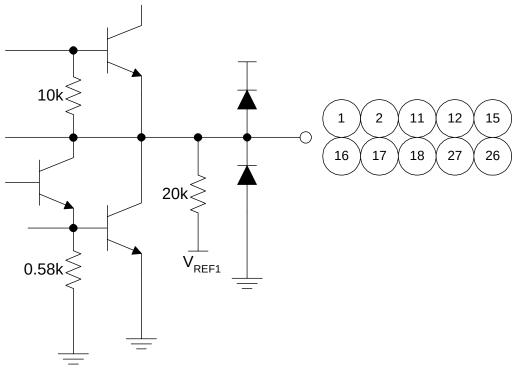


Figure 5. Driver Output

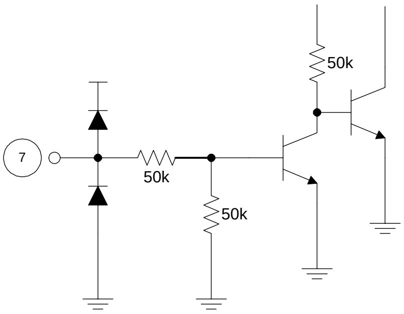


Figure 6. Mute Input

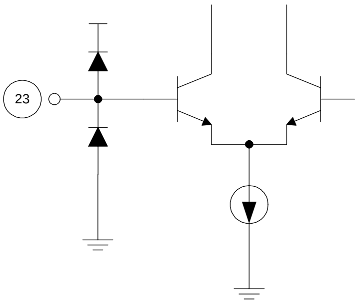


Figure 7. Bias Input

Equivalent Circuits (Continued)

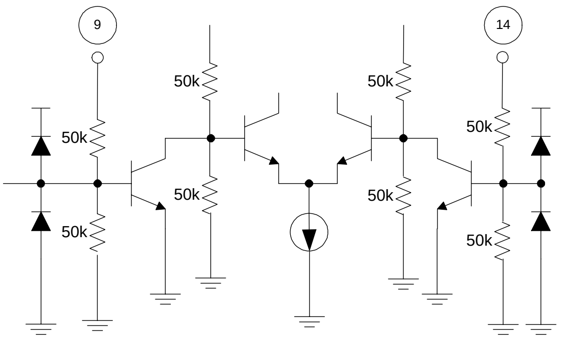


Figure 8. Loading Motor Driver Input

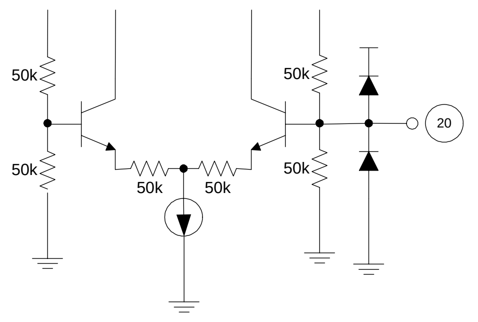


Figure 9. Loading Motor Speed Control Input

Typical Performance Characteristics

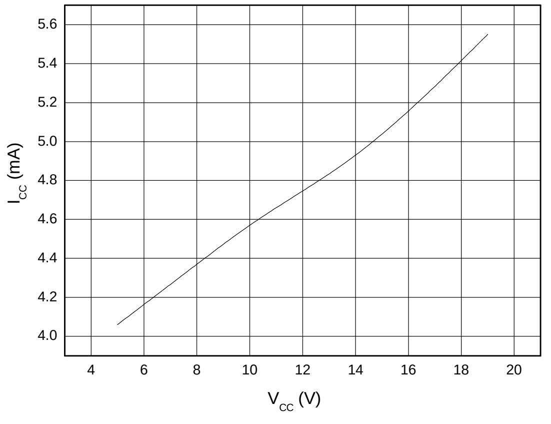


Figure 10. V_{CC} vs. I_{CC}

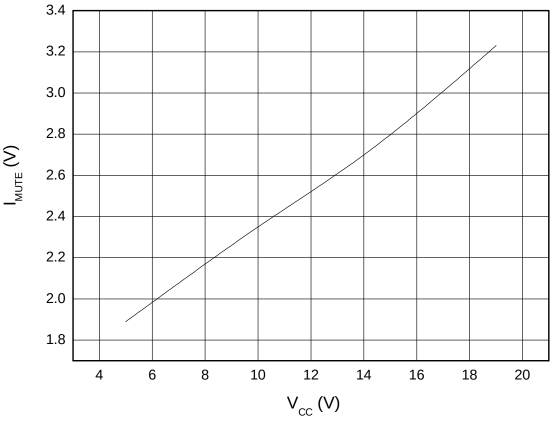


Figure 11. V_{CC} vs. I_{MUTE}

Typical Performance Characteristics (Continued)

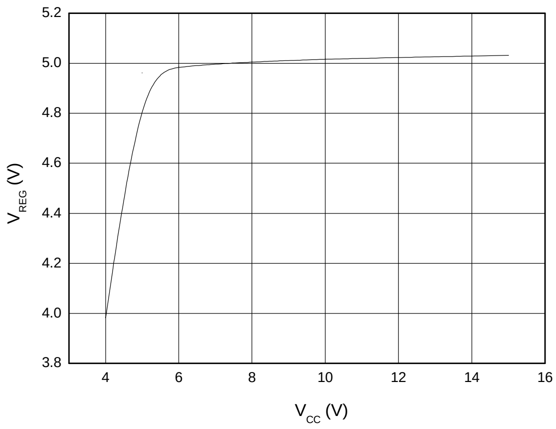


Figure 12. V_{CC} vs. V_{REG}

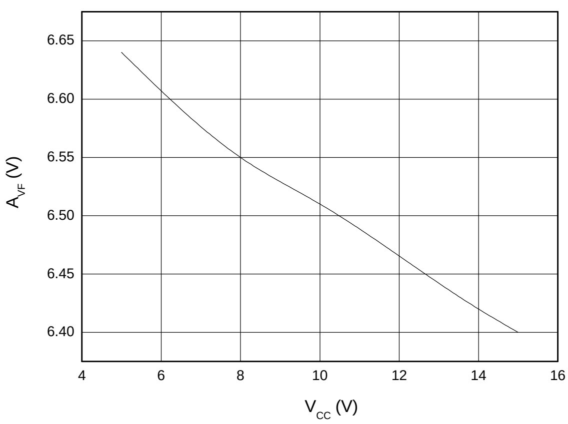


Figure 13. V_{CC} vs. A_{VF}

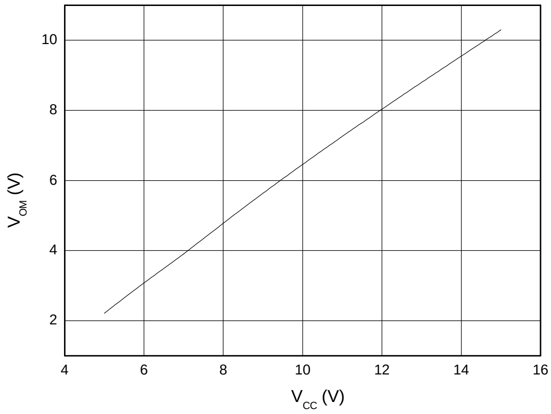


Figure 14. V_{CC} vs. V_{OM}

Test Circuit

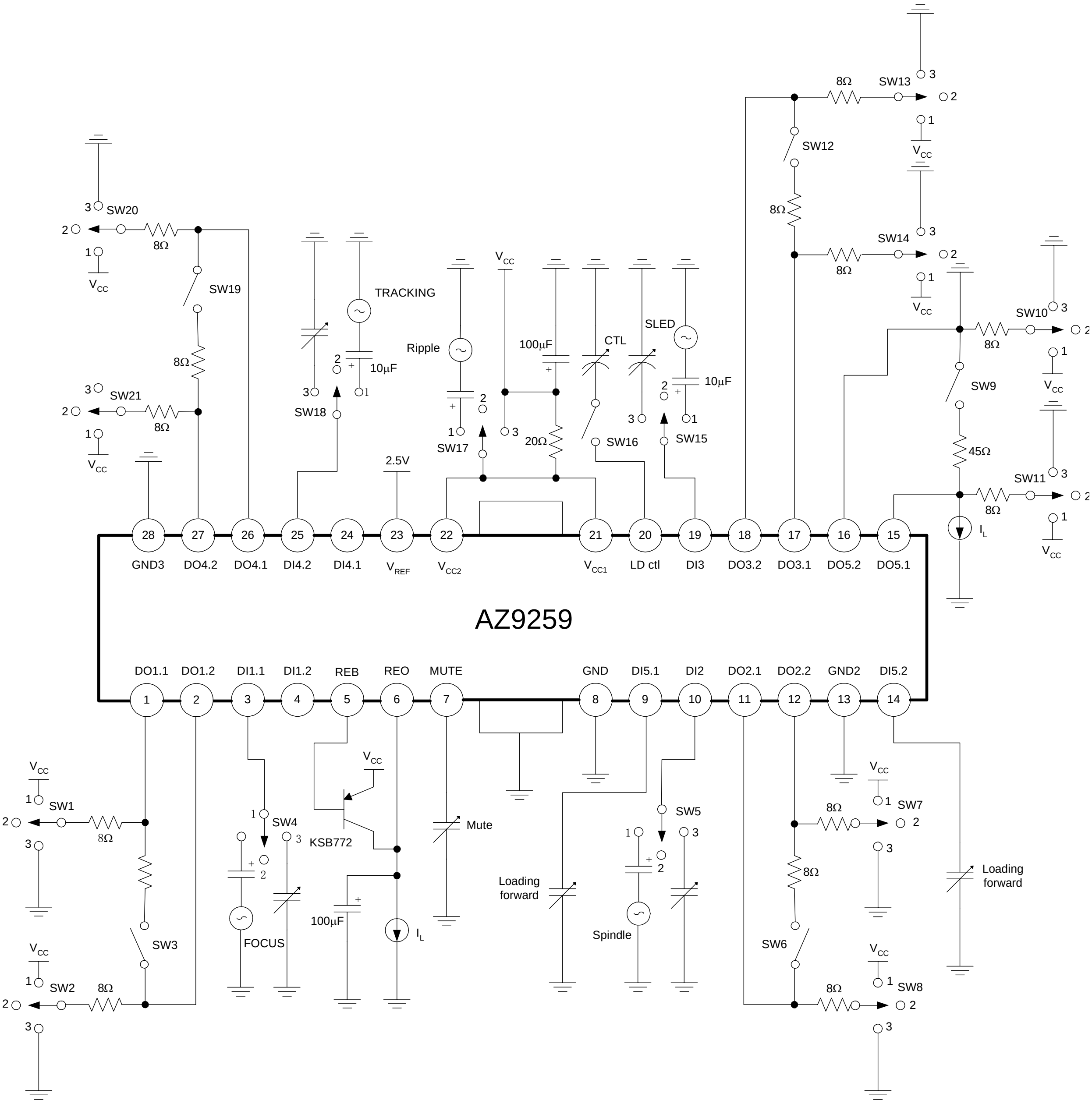


Figure 15. Test Circuit Diagram of AZ9259

Typical Application

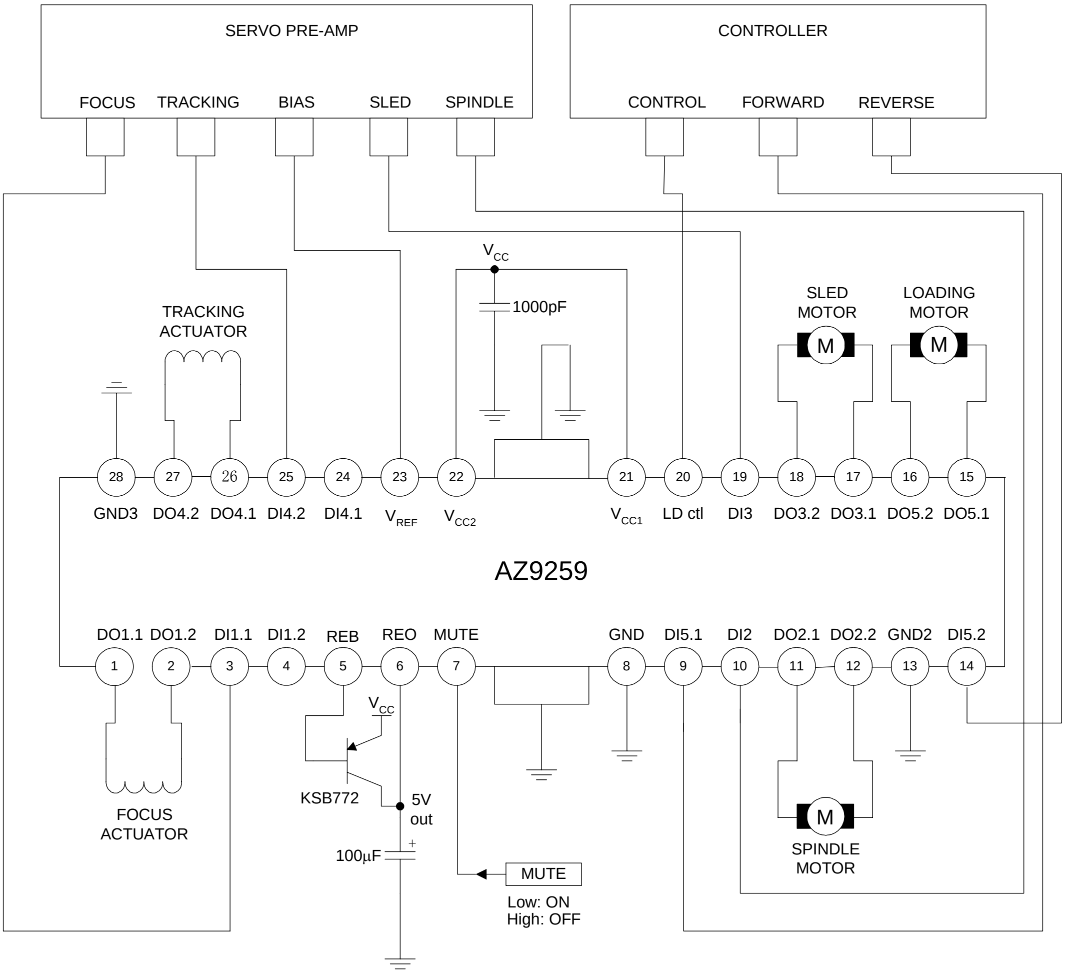


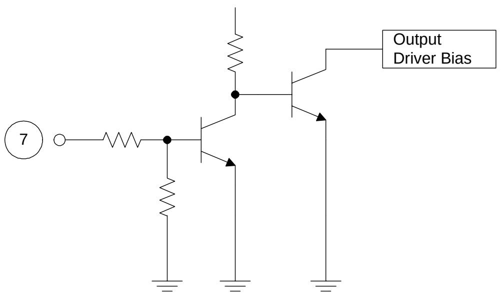
Figure 16. Typical Application of AZ9259 in Video Compact Disk Player

Application Information

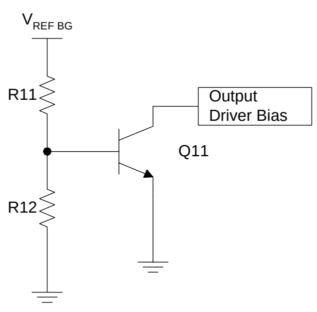
1. Mute

Pin 7	Mute Circuit
High	Turn-off
Low	Turn-on

- When the mute pin7 is open or the voltage of the mute pin7 is below 0.5V, the mute circuit is activated so that the output circuit will be muted.
- When the voltage of the mute pin is above 2V, the mute circuit is stopped and the output circuit operates normally.
- If the chip temperature rises above 175°C, then the TSD (Thermal shutdown) circuit is activated and the output circuit is muted.



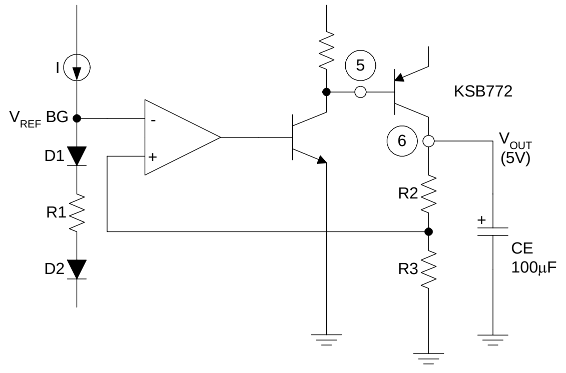
2. Thermal Hysteresis Shutdown



- The $V_{REF\ BG}$ is the output voltage of the band-gap-referenced biasing circuit and acts as the input voltage of the TSD circuit.
- The base-emitter voltage of the transistor, Q11 is designed to turn-on at below voltage. $V_{BE}=V_{REF\ BG} \times R12/(R11+R12)=400mV$
- When the chip temperature rises up to 175°C, then the turn-on voltage of the Q11 would drop down to 400mV. Hence, the Q11 would turn on so the output circuit will be muted. But when the temperature fall to 150°C, the Q11 will turn-off again and the output will operate normally.

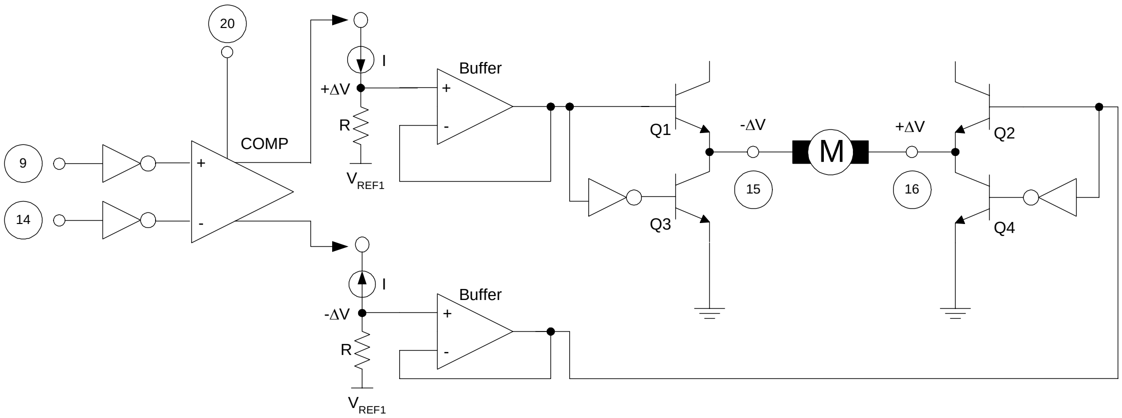
3. Regulator

- The $V_{REF\ BG}$ is the output voltage of the band-gap-referenced biasing circuit and is the reference voltage of the regulator.
- The external circuit is composed of the transistor, KSB772 and a capacitor, 100µF, and the capacitor is used as a ripple eliminator and should have a good temperature characteristics.
- The output voltage, V_{OUT} is decided as follows.
- $V_{OUT}=V_{REF\ BG} \times 2 = 2.5 \times 2 = 5V$ (R2=R3)



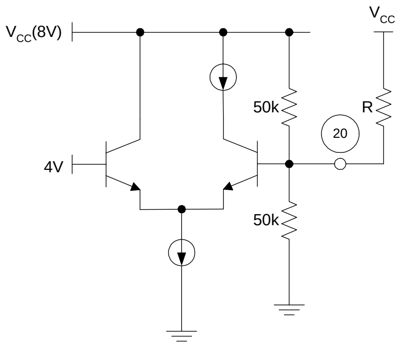
Application Information (Continued)

4. Loading Motor Driver



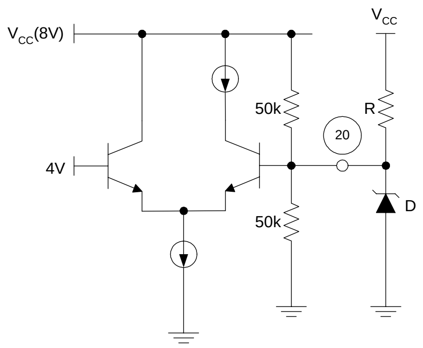
- The input voltages of (5V and 0V) or (0V and 5V) pairs are applied to the input pin9 and pin14 respectively.
- When the input voltages are applied to the input pin9 and input pin14, then the output of the comparator is decided depending the input voltage status.
- As shown in the above diagram, the difference ΔV, [V_{REF1}+(IxR)]-[V_{REF1}-(IxR)], is applied to the both terminals of the motor. The direction of the motor is decided by the voltage difference, +ΔV and -ΔV.
- The output characteristics are as follows,
  - If pin9=5V and pin14=0V, then pin15=+ΔV and pin16=-ΔV, hence the motor turns in forward direction.
  - If pin9=0V and pin14=5V, then pin15=-ΔV and pin16=+ΔV, hence the motor turns in reverse direction.
  - If pin9=5V and pin14=5V, then ΔV=0V, hence the motor stops.
  - If pin9=0V and pin14=0V, then ΔV=0V, hence the motor stops.
- When the rotation speed control of the loading motor is desired, refer to the following.

5. Loading Motor Speed Control

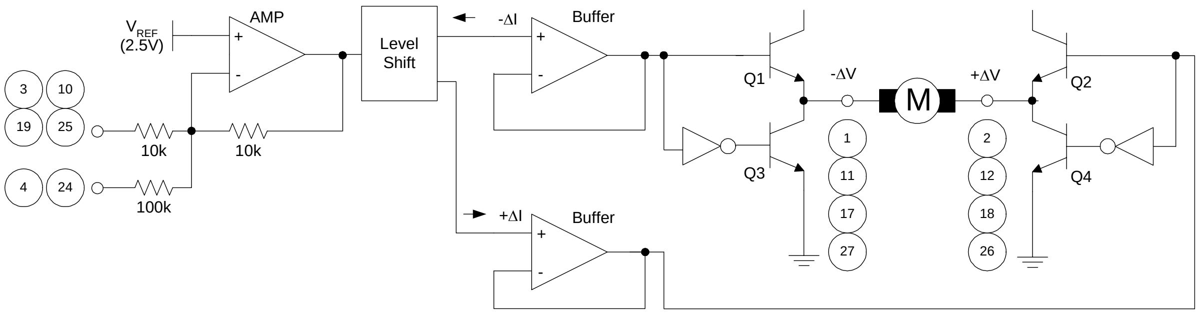


- If the torque of the loading motor is too low when it is used with the pin20 open, then it should be used as the above diagram.
- The desired torque could be obtained by selecting the appropriate resistor R as shown in the left diagram.
- If it is necessary, the Zener diode can be used in the below diagram.
- The maximum torque is obtained when the applied voltage at pin20 is about 6.8V (at V_{CC}= 8V).

Application Information (Continued)



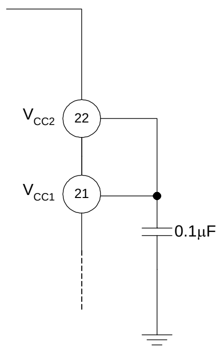
6. Driver (Except for Loading Motor Driver)



- The voltage, V_{REF}, is the reference voltage given by the bias voltage of the pin23.
- The input signal through the pin3 is amplified by 10k/10k times and then fed to the level shift.
- The level shift produces the current due to the difference between the input signal and the arbitrary reference signal. The current produced as +ΔI and -ΔI is fed into the driver buffer.
- Driver Buffer operates the power Transistor of the output stage according to the state of the input signal.
- The output stage is the BTL Driver and the motor is rotating in forward direction by operating transistor Q1 and transistor Q4. On the other hand, if transistor Q2 and transistor Q3 is operating, the motor is rotating in reverse direction.
- When the input voltage through the pin3 is below the V_{REF}, then the direction of the motor is in forward direction.
- When the input voltage through the pin3 is above the V_{REF}, then the direction of the motor is in reverse direction.
- If it is desired to change the gain, then the pin4 or pin24 can be used.
- When the bias voltage of the pin23 is below 1.4V, then the output circuit is muted.
- Hence for the normal operation, the bias voltage should be used between 1.6V~6.5V.

7. Connect a bypass capacitor of 0.1μF between the supply voltage sources and the ground to stabilize the input supply voltage.

Application Information (Continued)

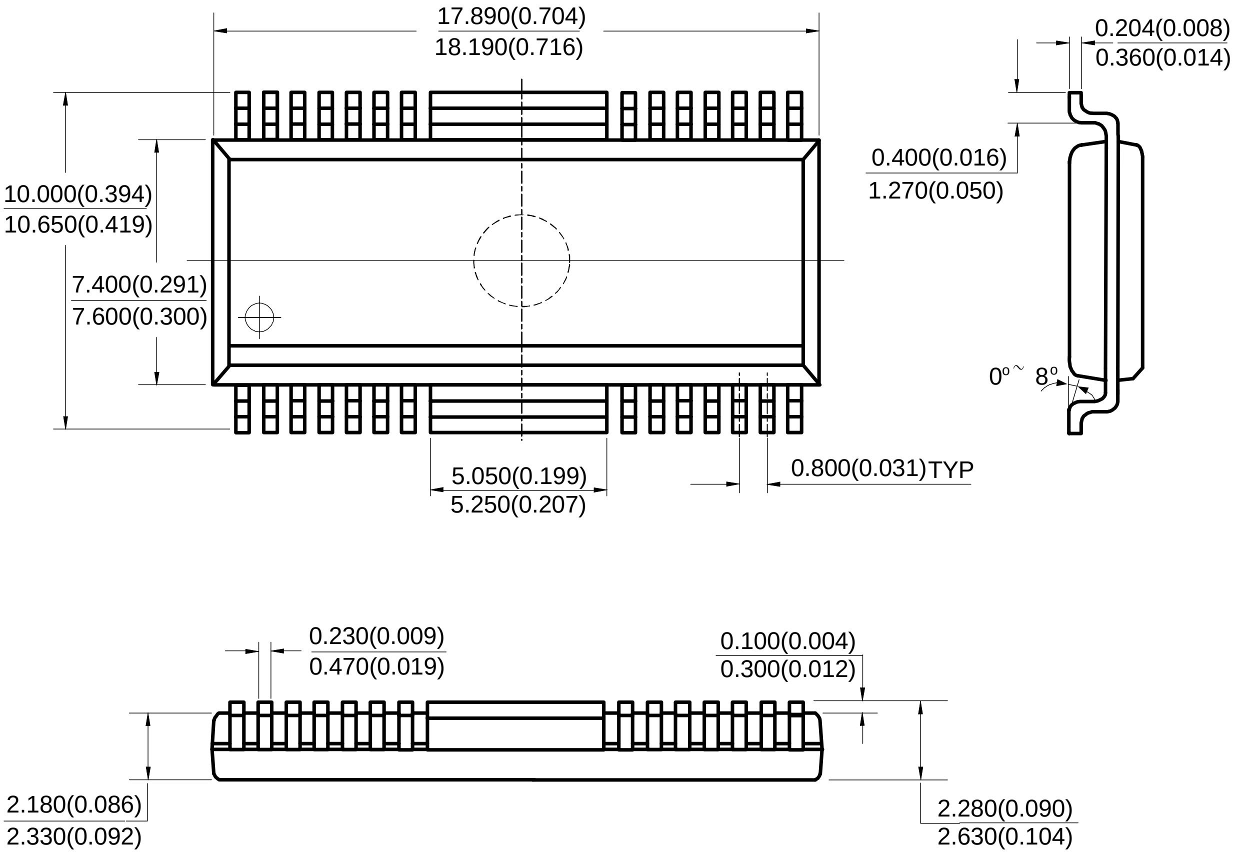


8. Radiation fin is connecting to the internal GND of the package.

Connect the fin to the external GND.

Mechanical Dimensions

HSOP-28 **Unit: mm(inch)**



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