

5-CHANNEL MOTOR DRIVER FOR DVD PLAYER

AM5680

General Description

The AM5680 is a five-channel BTL driver IC for driving motors and actuators used in DVD player. It contains two independent precise voltage regulators with adjustable range from 1.5V to 4V. Furthermore, an under voltage detector is provided for system reset.

The AM5680 is available in standard HSOP-28 package.

Features

- 4 channels DC Motor BTL Driver
- 1 channel Forward/Reverse Control DC Motor BTL Driver
- Built-in Voltage Detector for System Reset
- Built-in Level Shift Circuit
- Built-in Mute Mode
- Built-in Thermal Shutdown Circuit
- Two Built-in Regulator Controllers

Application

- DVD Player

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Figure 1. Package Type of AM5680

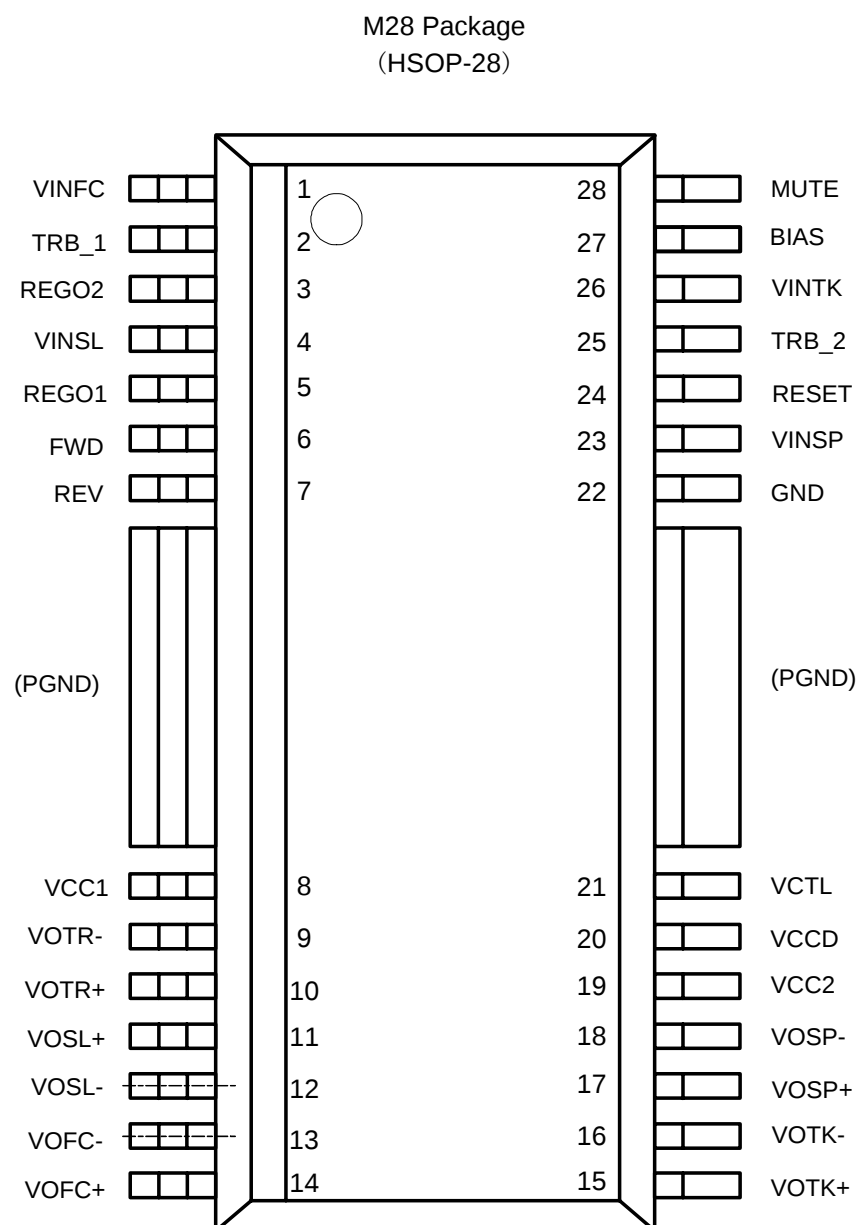
**5-CHANNEL MOTOR DRIVER FOR DVD PLAYER****AM5680****Pin Configuration**

Figure 2. Pin Configuration of AM5680 (Top View)

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Pin Description

Pin Number	Pin Name	Function
1	VINFC	Input for focus driver
2	TRB_1	Regulator 1 driver output
3	REGO2	Regulator 2 feedback input
4	VINSL	Input for the sled driver
5	REGO1	Regulator 1 feedback input
6	FWD	Tray driver forward input
7	REV	Tray driver reverse input
8	VCC1	V _{CC} for pre-drive block and power block of sled and tray
9	VOTR-	Tray driver output (-)
10	VOTR+	Tray driver output (+)
11	VOSL+	Sled driver output (+)
12	VOSL-	Sled driver output (-)
13	VOFC-	Focus driver output (-)
14	VOFC+	Focus driver output (+)
15	VOTK+	Tracking driver output (+)
16	VOTK-	Tracking driver output (-)
17	VOSP+	Spindle driver output (+)
18	VOSP-	Spindle driver output (-)
19	VCC2	V _{CC} for power block of spindle, tracking and focus
20	VCCD	Input for voltage detection
21	VCTL	Speed control input of tray driver
22	GND	Ground
23	VINSP	Input for spindle driver
24	RESET	Output for system reset
25	TRB_2	Regulator 2 driver output
26	VINTK	Input for tracking driver
27	BIAS	Input for reference voltage
28	MUTE	Input for mute control

Note 1: Symbols of + and - (output of drivers) mean polarity with respect to input pin.
(For example, if voltage of pin 1 is high, pin 14 is high and pin 13 is low.)

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Functional Block Diagram

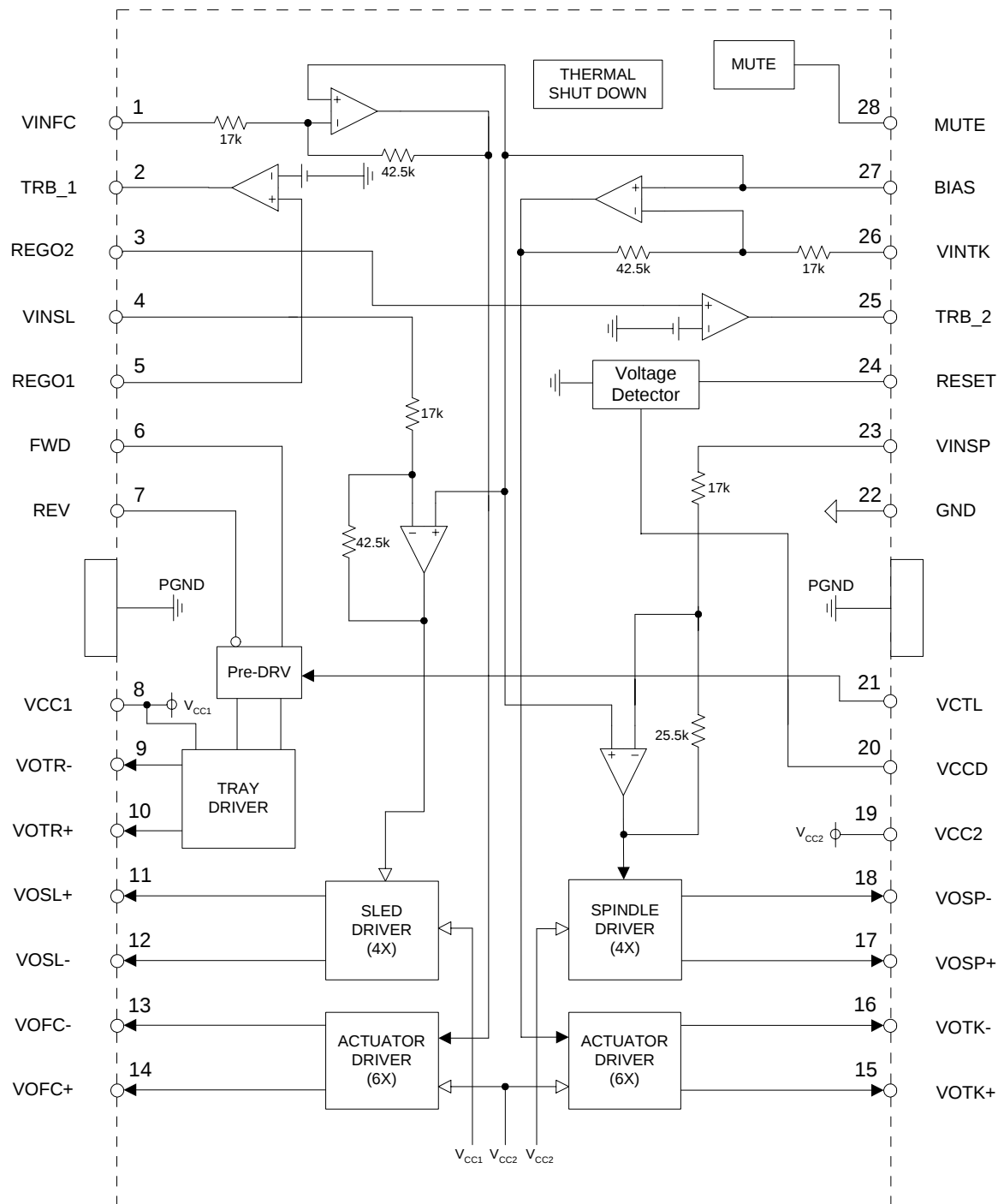


Figure 3. Functional Block Diagram of AM5680

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Ordering Information

AM5680 □ - □

Circuit Type _____ E1: Lead Free

Package _____

M28: HSOP-28

Package	Temperature Range	Part Number	Marking ID	Packing Type
HSOP-28	0 to 70°C	AM5680M28-E1	AM5680M28-E1	Tube

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

Absolute Maximum Ratings ($T_A=25^\circ\text{C}$) (Note 2)

Parameter	Symbol	Value	Unit
Supply Voltage	$V_{CC1, 2}$	8.8	V
Power Dissipation	P_D	1.7 (Note 3)	W
Operating Junction Temperature	T_J	150	°C
Storage Temperature Range	T_{STG}	-55 to 150	°C
ESD (Human Body Model)	ESD	2000	V
ESD (Machine Model)	ESD	200	V

Note 2: 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 3:

- When mounted on a 70mm×70mm×1.6mm glass epoxy board.
- Reduced by 13.6mW for each increase in T_A of 1°C over 25°C.

Recommended Operating Conditions ($T_A=25^\circ\text{C}$)

Parameter	Symbol	Min	Max	Unit
Power Supply Voltage	V_{CC1}	4.3	8	V
	V_{CC2}	4.3 to V_{CC1}		V
Operating Temperature	T_A	0	70	°C

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Electrical Characteristics (Note 4)

($T_A=25^\circ\text{C}$, $V_{CC1}=V_{CC2}=5\text{V}$, $V_{BIAS}=1.65\text{V}$, $R_L=10\Omega/45\Omega$, unless otherwise specified.)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Quiescent Current	I_{QC}			16		mA
Mute ON Voltage	V_{STON}		0		0.5	V
Mute OFF Voltage	V_{STOFF}		2.0		V_{CC1}	V
Focus Driver						
Output Offset Voltage	V_{OOFFC}		-50		50	mV
Maximum Output Voltage	V_{OMFC}	at 10Ω load	3.0	3.5		V
Closed-loop Voltage Gain	G_{VFC}	$V_{IN}=V_{BIAS}\pm 0.2\text{V}$	21.5	23.5	25.5	dB
Tracking Driver						
Output Offset Voltage	V_{OOFTK}		-50		50	mV
Maximum Output Voltage	V_{OMTK}	at 10Ω load	3.0	3.5		V
Closed-loop Voltage Gain	G_{VTK}	$V_{IN}=V_{BIAS}\pm 0.2\text{V}$	21.5	23.5	25.5	dB
Sled Driver						
Output Offset Voltage	V_{OOFSL}		-100		100	mV
Maximum Output Voltage	V_{OMSL}	at 10Ω load	3.0	3.5		V
Closed-loop Voltage Gain	G_{VSL}	$V_{IN}=V_{BIAS}\pm 0.2\text{V}$	18.0	20.0	22.0	dB
Spindle Driver						
Output Offset Voltage	V_{OOFSP}		-50		50	mV
Maximum Output Voltage	V_{OMSP}	at 10Ω load	3.0	3.5		V
Closed-loop Voltage Gain	G_{VSP}	$V_{IN}=V_{BIAS}\pm 0.2\text{V}$	13.5	15.5	17.5	dB
Gain Error by Polarity	ΔG_{VSP}	$V_{IN}=V_{BIAS}\pm 0.2\text{V}$	0	1	2	dB
Voltage Detector						
Detecting Voltage	V_{CCD}	$R_L=200\Omega$, $V_{OL}<0.4\text{V}$	2.75	2.9	3.05	V
Low Level Output Voltage	V_{OL}				0.4	V
Hysteresis Voltage				200		mV
Detecting Voltage Temperature Coefficient				0.01		%/ $^\circ\text{C}$

**5-CHANNEL MOTOR DRIVER FOR DVD PLAYER****AM5680****Electrical Characteristics (Continued, Note 4)**(T_A=25°C, V_{CC1}=V_{CC2}=5V, V_{BIAS}=1.65V, R_L=10Ω/45Ω, unless otherwise specified.)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Tray Driver						
Output Saturation Voltage 1	V _{SAT1TR}	Upper+Lower saturation, I _L =200mA	0.7	1.3	1.6	V
Output Saturation Voltage between FWD and REV	ΔV _{SAT1TR}	Output Saturation Voltage 1 between FWD and REV	-0.1		0.1	V
Output Saturation Voltage 2	V _{SAT2TR}	Upper+Lower saturation, I _L =500mA	1.0	2.1	2.5	V
Output Adjustable Gain on "H" Side Voltage	G _{VTRH}	at 45Ω load, V _{VCTL} =1V	7.4	9.2	11	dB
Tray Motor Driver Input Logic						
High Level Input Voltage	V _{IH}		1.5		V _{CC1}	V
Low Level Input Voltage	V _{IL}		-0.3		0.5	V
High Level Input Current	I _{IH}	V _{FWD} =V _{REV} =5V		110	270	μA
Regulator (Note 5)						
Output Voltage	V _{REG}	I _L =500mA	1.5		4.0	V
Output Load Differential	ΔV _{RL}	I _L =0 to 500mA	-50	0	50	mV
Power Supply Voltage Differential	ΔV _{VCC}	V _{CC} =4.3 to 8V, I _L =500mA	-25	0	25	mV

Note 4: This device is not designed for protection against radioactive rays.

Note 5: It is based on 8550D PNP transistor.

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Typical Performance Characteristics

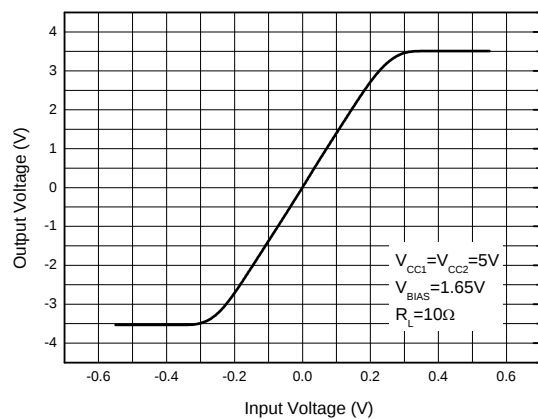


Figure 4. Focus Driver Characteristics (Note 6)

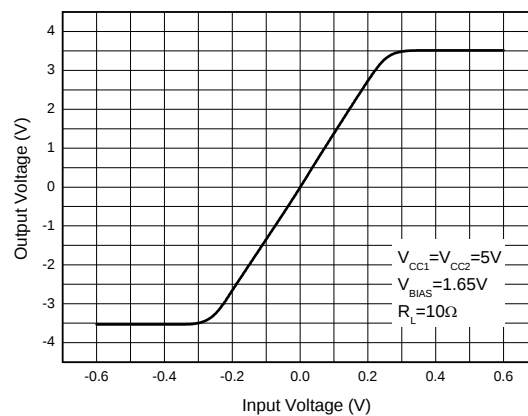


Figure 5. Tracking Driver Characteristics (Note 6)

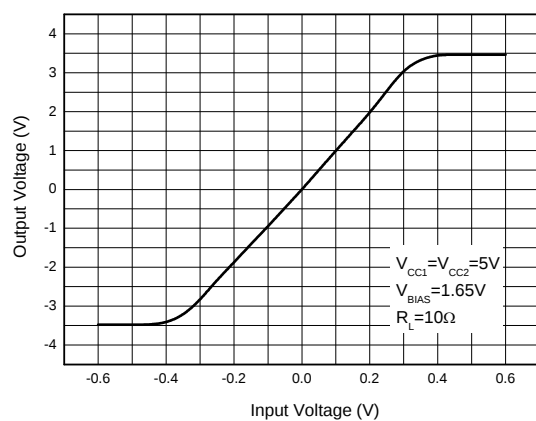


Figure 6. Sled Driver Characteristics (Note 6)

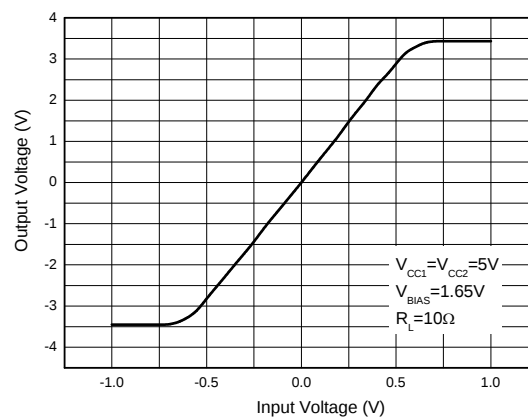


Figure 7. Spindle Driver Characteristics (Note 6)

Note 6: Input voltage herein is referenced to Bias pin voltage.

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Typical Performance Characteristics (Continued)

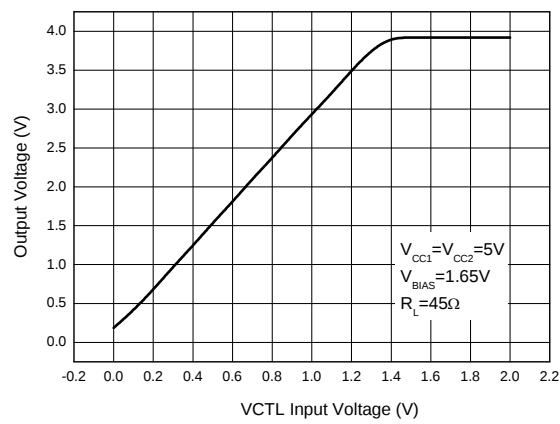


Figure 8. Tray Channel Output Voltage vs. VCTL Input Voltage

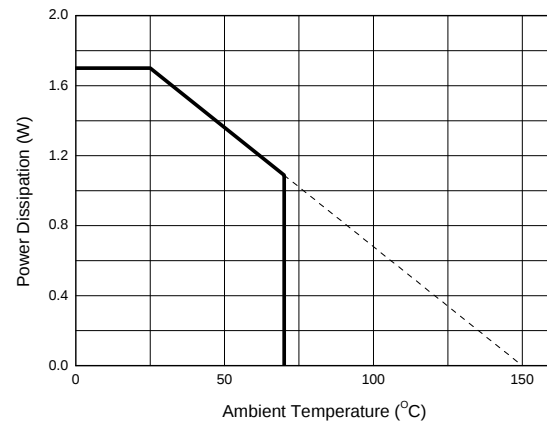


Figure 9. Power Dissipation Curve (Note 3)



5-CHANNEL MOTOR DRIVER FOR DVD PLAYER

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Typical Application

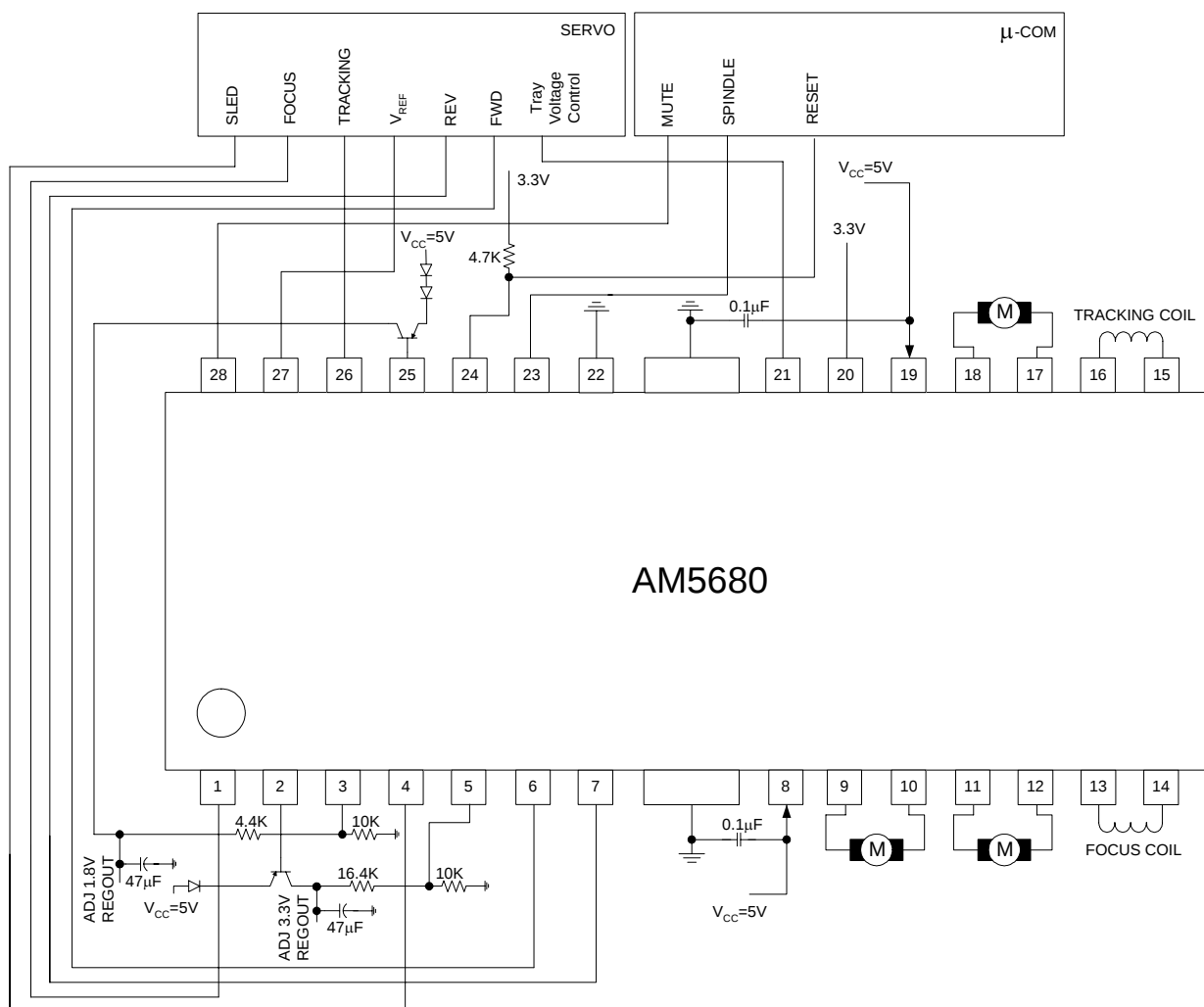


Figure 10. Typical Application of AM5680 in DVD Player

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Application Information

1. The built-in thermal shutdown circuit mutes the output current when the chip temperature reaches 175°C (Typ). The hysteresis is set to 30°C (Typ), so the circuit will start up again when the chip temperature falls to 145°C (Typ).

2. In case mute pin voltage is under 0.5V or this pin is not connected, output current is muted (except for tray motor driver). Mute pin voltage should be more than 2.0V for normal application.

3. BIAS pin (pin 27) should be pulled up to more than 1.2V. In case the bias pin voltage is pulled down below 0.9V (Typ), the output current is muted.

4. Insert the bypass capacitor (about 0.1μF) between VCC1,2 pin and GND pin as close as possible to this chip.

5. Heat dissipation fins are attached to the GND on the inside of the package. Make sure to connect them to the external GND.

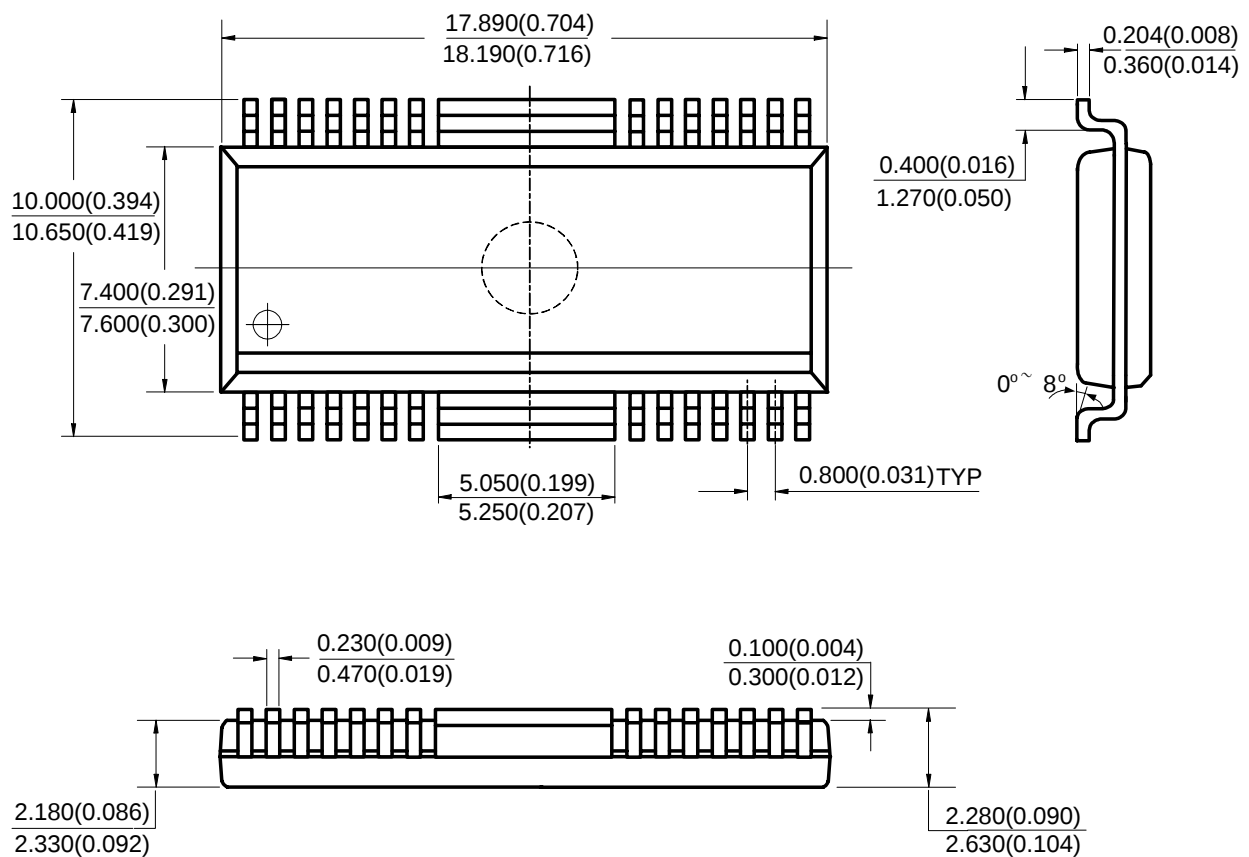
6. Tray driver logic input:

FWD (pin6)	REV (pin7)	VOTR+ (pin10)	VOTR- (pin9)	Function
L	L	OPEN	OPEN	Open mode
L	H	L	H	Reverse mode
H	L	H	L	Forward mode
H	H	L	L	Brake mode

Input circuit of pins 6 and 7 is designed to avoid simultaneous activation of upper and lower output tray; however, in order to improve reliability, apply motor forward/reverse input once through open mode. Time period for open is recommended to be longer than 10msec.

"H" side output voltage on output pins (VOTR+ or VOTR-) varies depending on output control terminal for tray (pin 21). "H" side output voltage is set to three times (9.2dB Typ) the voltage of VCTL (pin 21). And, "L" side output voltage is equal to output saturation voltage.

7. For 3.3V I/O system, if voltage applied to VCCD (pin 20) is lower than detector threshold voltage (Typ 2.9V), RESET pin (pin 24) will generate a L level as reset signal. Once the VCCD comes over 3.1V, RESET pin will change to H level immediately.

**5-CHANNEL MOTOR DRIVER FOR DVD PLAYER****AM5680****Mechanical Dimensions****HSOP-28****Unit: mm(inch)**



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