



**4-CHANNEL BTL MOTOR DRIVER FOR DVD**

**AM5954A**

**General Description**

The AM5954A is a four-channel BTL driver IC for driving the motors and actuators in products for DVD-player drivers. Two of the channels use current feedback to minimize the current phase shift caused by the influence of load inductance. This IC is an improved version of AZ5954.

The AM5954A is available in HSOP-28 Package.

**Features**

- Level Shift Circuit On Chip
- Thermal Shutdown Circuit On Chip
- Internal Standby Mode
- Built-in Thermal Shutdown Circuit

**Applications**

- DVD Player
- Recorder Driver



Figure 1. Package Type of AM5954A



**4-CHANNEL BTL MOTOR DRIVER FOR DVD**

**AM5954A**

**Pin Configuration**

M Package  
(HSOP-28)

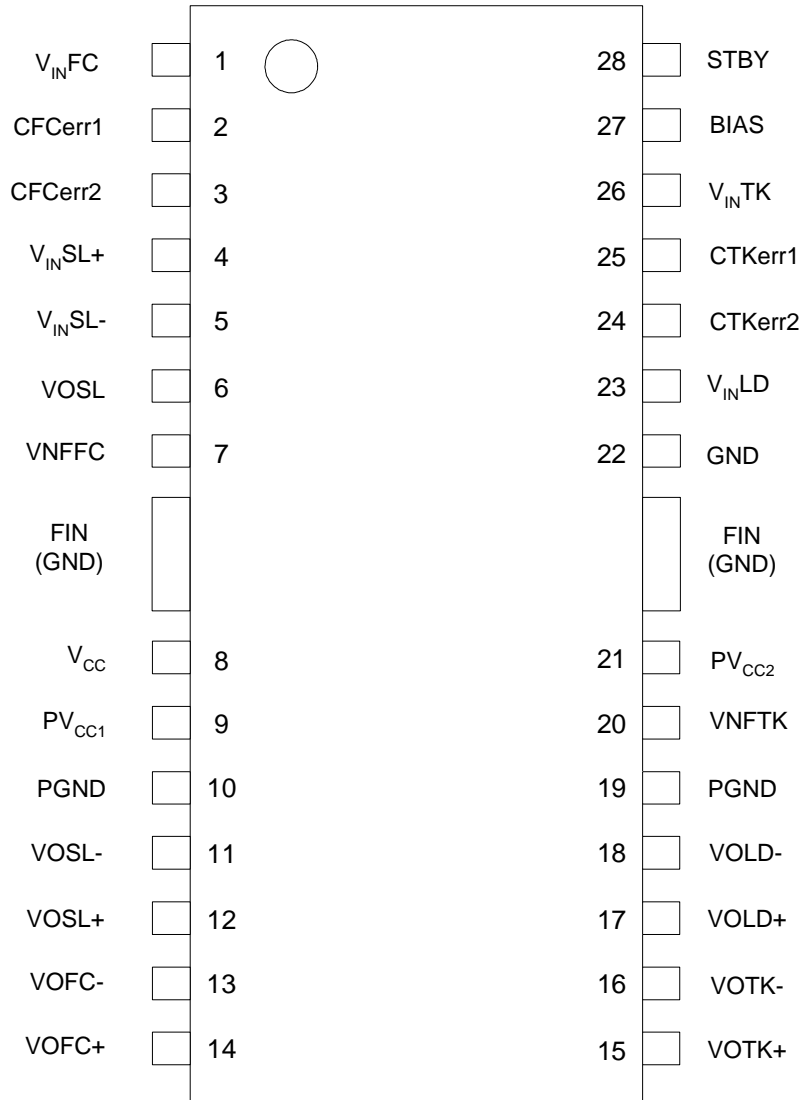


Figure 2. Pin Configuration of AM5954A (Top View)

**4-CHANNEL BTL MOTOR DRIVER FOR DVD****AM5954A****Pin Description (Note 1)**

Pin Number	Pin Name	Function
1	V <sub>INFC</sub>	Focus driver input
2	CFCerr1	For connection of capacitor for the error amp filter
3	CFCerr2	For connection of capacitor for the error amp filter
4	V <sub>INSL+</sub>	Op Amp input (+) for the sled driver
5	V <sub>INSL-</sub>	Op Amp input (-) for the sled driver
6	VOSL	Op Amp output for the sled driver
7	VNFFC	Focus driver feedback pin
8	V <sub>CC</sub>	Supply voltage
9	PV <sub>CC1</sub>	Power supply voltage for sled driver block
10	PGND	Ground for sled driver block
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	VOLD+	Loading driver output (+)
18	VOLD-	Loading driver output (-)
19	PGND	Ground for actuator driver block
20	VNFTK	Tracking driver feedback pin
21	PV <sub>CC2</sub>	Power supply voltage for actuator driver block
22	GND	Ground
23	V <sub>INLD</sub>	Loading driver input
24	CTKerr2	For connection of capacitor for the error amp filter
25	CTKerr1	For connection of capacitor for the error amp filter
26	V <sub>INTK</sub>	Tracking driver input
27	BIAS	Bias input
28	STBY	Standby control

Note 1: The indicated polarities for the output pin are for when all inputs are (+).

The output H bridge power supply pins are PV<sub>CC2</sub> for the focus, tracking channel, PV<sub>CC1</sub> for the loading channel, and V<sub>CC</sub> for the pre-block and sled channel.

Always ensure that  $V_{CC} \geq PV_{CC}$ .



**4-CHANNEL BTL MOTOR DRIVER FOR DVD**

**AM5954A**

**Functional Block Diagram**

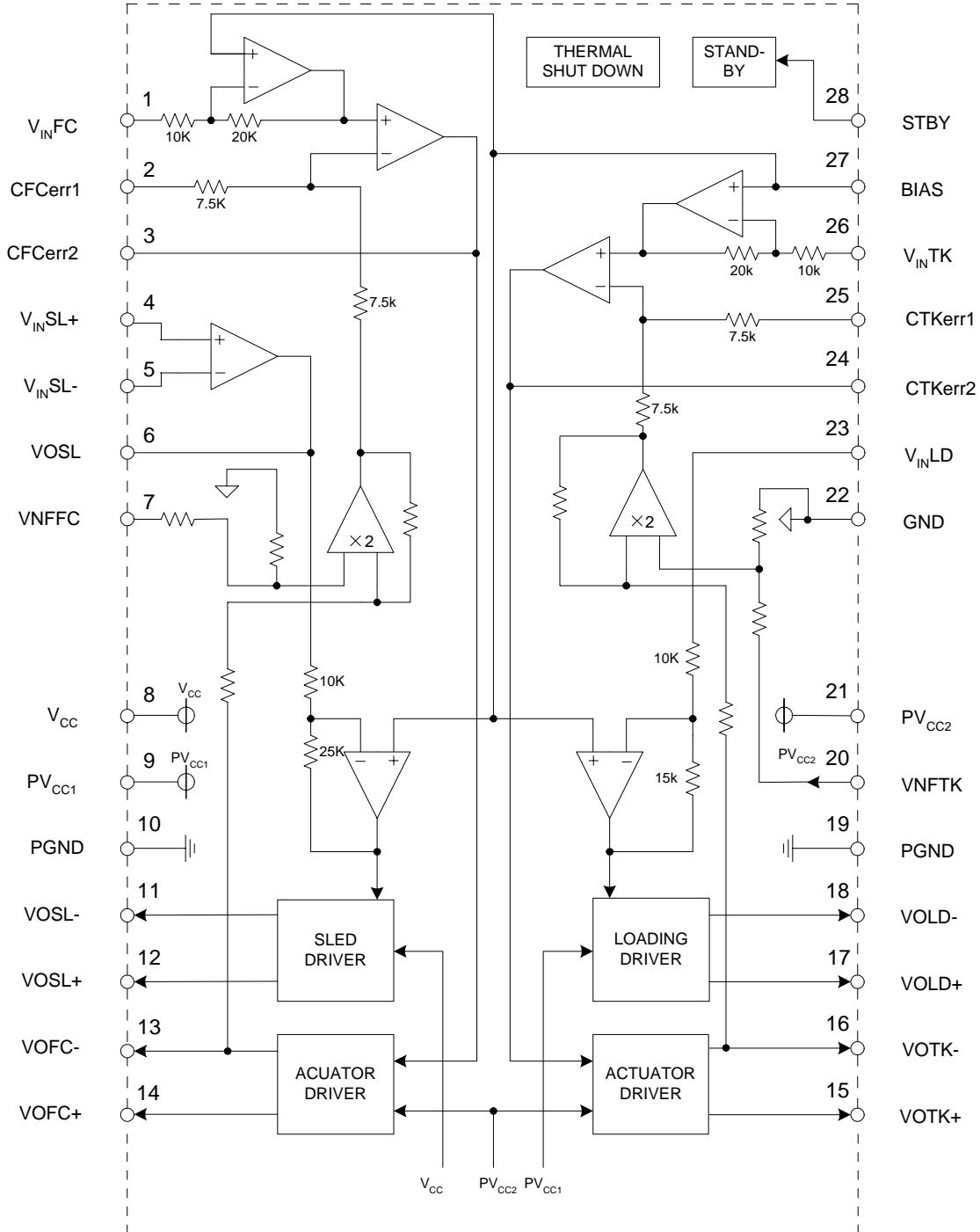
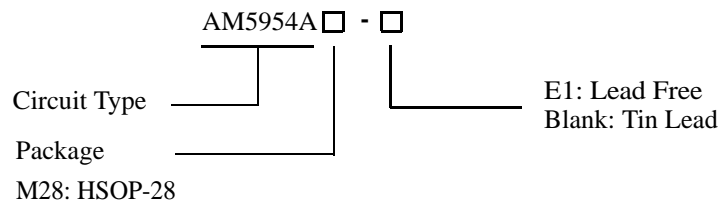


Figure 3. Functional Block Diagram of AM5954A

**4-CHANNEL BTL MOTOR DRIVER FOR DVD****AM5954A****Ordering Information**

Package	Temperature Range	Part Number		Marking ID		Packing Type
		Tin Lead	Lead Free	Tin Lead	Lead Free	
HSOP-28	0 to 70°C	AM5954AM28	AM5954AM28-E1	AM5954AM28	AM5954AM28-E1	Tube

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

**Absolute Maximum Ratings (Note 2)**

Parameter	Symbol	Value	Unit
Supply Voltage	$V_{CC}, PV_{CC1/2}$	13.5	V
Power Dissipation	$P_D$	1.7 (Note 3)	W
ESD (Human Model)	ESD	2000	V
Storage Temperature Range	$T_{STG}$	-55 to 150	°C

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: The power dissipation is reduced by 13.6mW for each increase in temperature of 1°C over 25°C.

**Recommended Operating Conditions**

Parameter	Symbol	Min	Max	Unit
Supply Voltage	$V_{CC}$	4.0	13.2	V
	$PV_{CC1}$	4.0	$V_{CC}$	V
	$PV_{CC2}$	4.0	$V_{CC}$	V
Operating Temperature	$T_A$	0	70	°C



**4-CHANNEL BTL MOTOR DRIVER FOR DVD**

**AM5954A**

**Electrical Characteristics**

( $T_A=25^\circ\text{C}$ ,  $V_{CC}=PV_{CC}=12\text{V}$ ,  $PV_{CC2}=5\text{V}$ ,  $V_{BIAS}=2.5\text{V}$ ,  $R_{L1}=R_{L2}=R_{L3}=R_{L4}=8\Omega$ ,  $R_D=0.5\Omega$ ,  $C_{FC}=C_{TK}=100\text{pF}$ , unless otherwise specified.)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Quiescent Current	$I_{CC}$			18	27	mA
Standby Current	$I_{ST}$				0.5	mA
Standby-on Voltage	$V_{STON}$	All channels off	0		0.5	V
Standby-off Voltage	$V_{STOFF}$	All channels on	2.0			V
<b>Actuator Driver</b>						
Output Offset Current	$I_{OO}$		-6		6	mA
Maximum Output Amplitude	$V_{OM}$	$V_{IN}=V_{BIAS}\pm 1.5\text{V}$	3.6	3.8		V
Transmission Gain	gm	$V_{IN}=V_{BIAS}\pm 0.2\text{V}$	1.3	1.5	1.7	A/V
<b>Sled Motor Driver/Pre Op Amp</b>						
Common Input Voltage Range	$V_{ICM}$	$V_{BIAS}=6\text{V}$	-0.3		11.0	V
		$V_{CC}=PV_{CC1}=5\text{V}$	-0.3		4.0	V
Input Bias Current	$I_{IB}$			14	300	nA
Output Low Level Voltage	$V_{OL}$			0.1	0.3	V
Output Source Current	$I_{SO}$		0.3	0.58		mA
Output Sink Current	$I_{SI}$		1			mA
<b>Sled Motor Driver</b>						
Output Offset Voltage	$V_{OOFSL}$	$V_{CC}=5\text{V}$	-100		100	mV
Maximum Output Voltage	$V_{OMSL}$	$V_{IN}=V_{BIAS}\pm 1.5\text{V}$	7.5	9		V
Closed-loop Voltage Gain	$G_{VSL}$	$V_{IN}=V_{BIAS}\pm 0.2\text{V}$	18.0	20.0	22.0	dB
<b>Loading Motor Driver</b>						
Output Offset Voltage	$V_{OOFLD}$		-50		50	mV
Maximum Output Voltage	$V_{OMLD}$	$V_{IN}=V_{BIAS}\pm 2.0\text{V}$	7.5	9		V
		$V_{IN}=V_{BIAS}\pm 1.5\text{V}$ $V_{CC}=PV_{CC1}=5\text{V}$	3.6	3.8		V
Closed-loop Voltage Gain	$G_{VLD}$	$V_{IN}=V_{BIAS}\pm 0.2\text{V}$	13.5	15.5	17.5	dB
Gain Error by Polarity	$\Delta G_{VLD}$	$V_{IN}=V_{BIAS}\pm 0.2\text{V}$	0	1	2	dB



**4-CHANNEL BTL MOTOR DRIVER FOR DVD**

**AM5954A**

**Test Circuit**

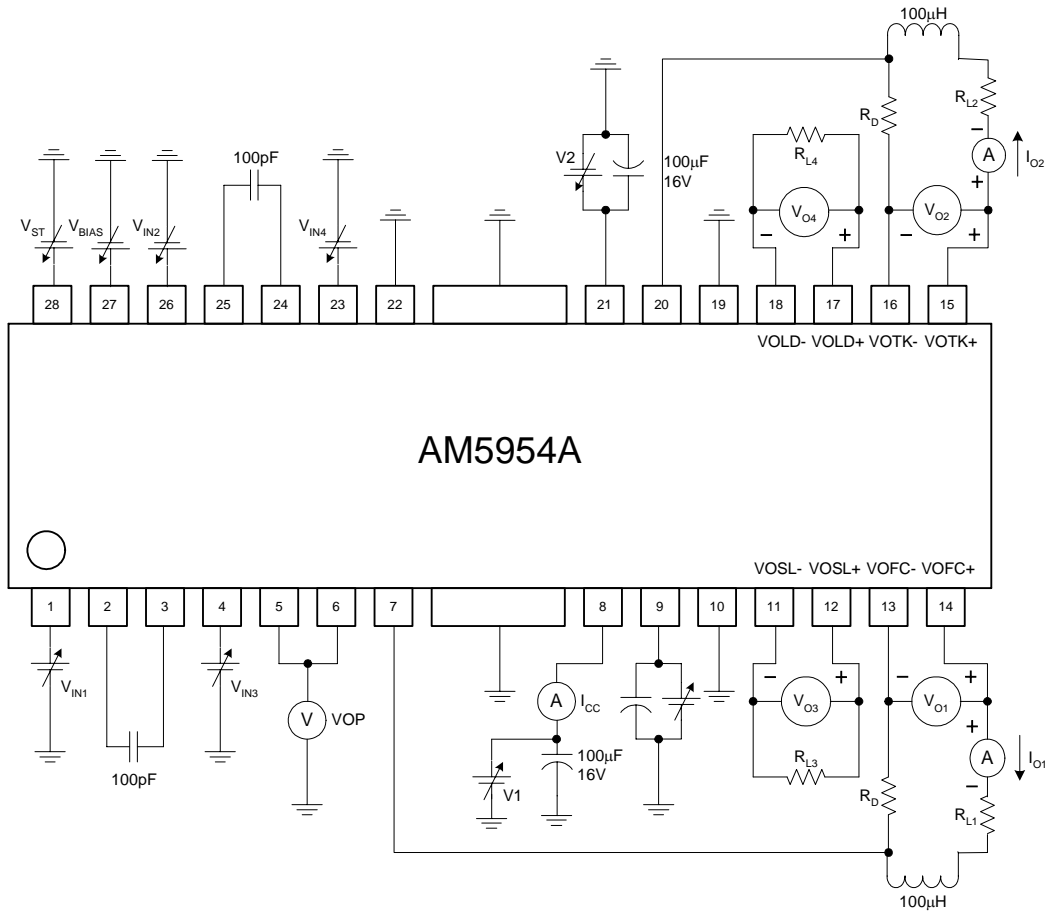


Figure 4. Test Circuit of AM5954A



**4-CHANNEL BTL MOTOR DRIVER FOR DVD**

**AM5954A**

**Typical Performance Characteristics**

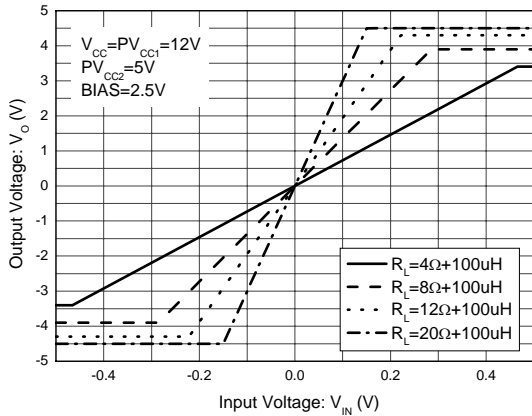


Figure 5. Driver I/O Characteristics (Focus and Tracking)

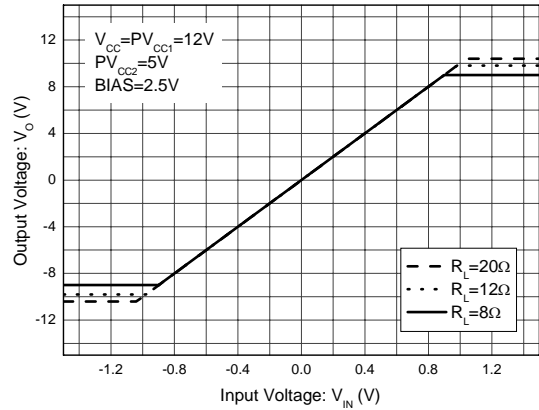


Figure 6. Driver I/O Characteristics (Sled)

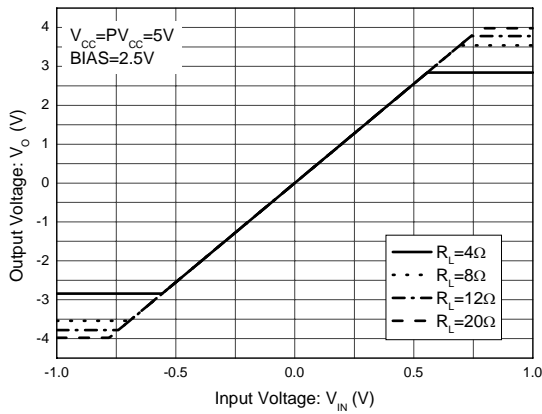


Figure 7. Driver I/O Characteristics (Loading)

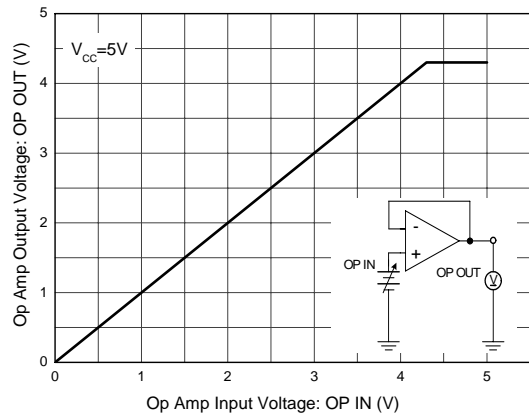


Figure 8. Op Amp I/O Characteristics





4-CHANNEL BTL MOTOR DRIVER FOR DVD

AM5954A

Typical Performance Characteristics (Continued)

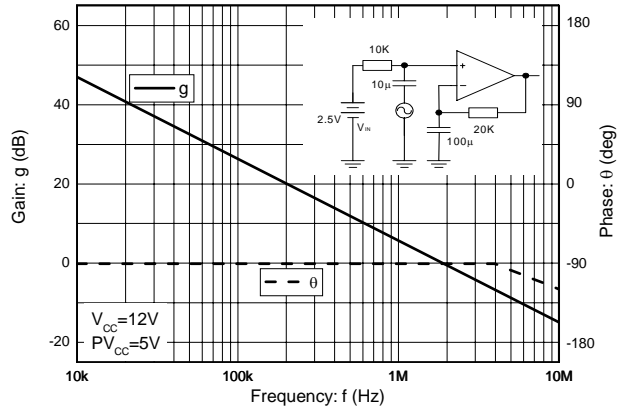


Figure 9. Op Amp Phase-Frequency, Amplitude-Frequency Characteristics

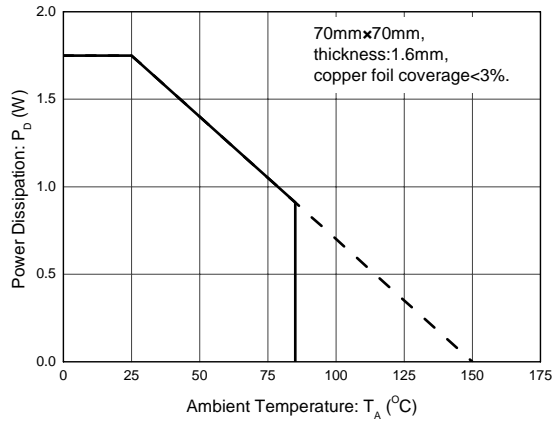


Figure 10. Power Dissipation Curve



**4-CHANNEL BTL MOTOR DRIVER FOR DVD** **AM5954A**

**Typical Application**

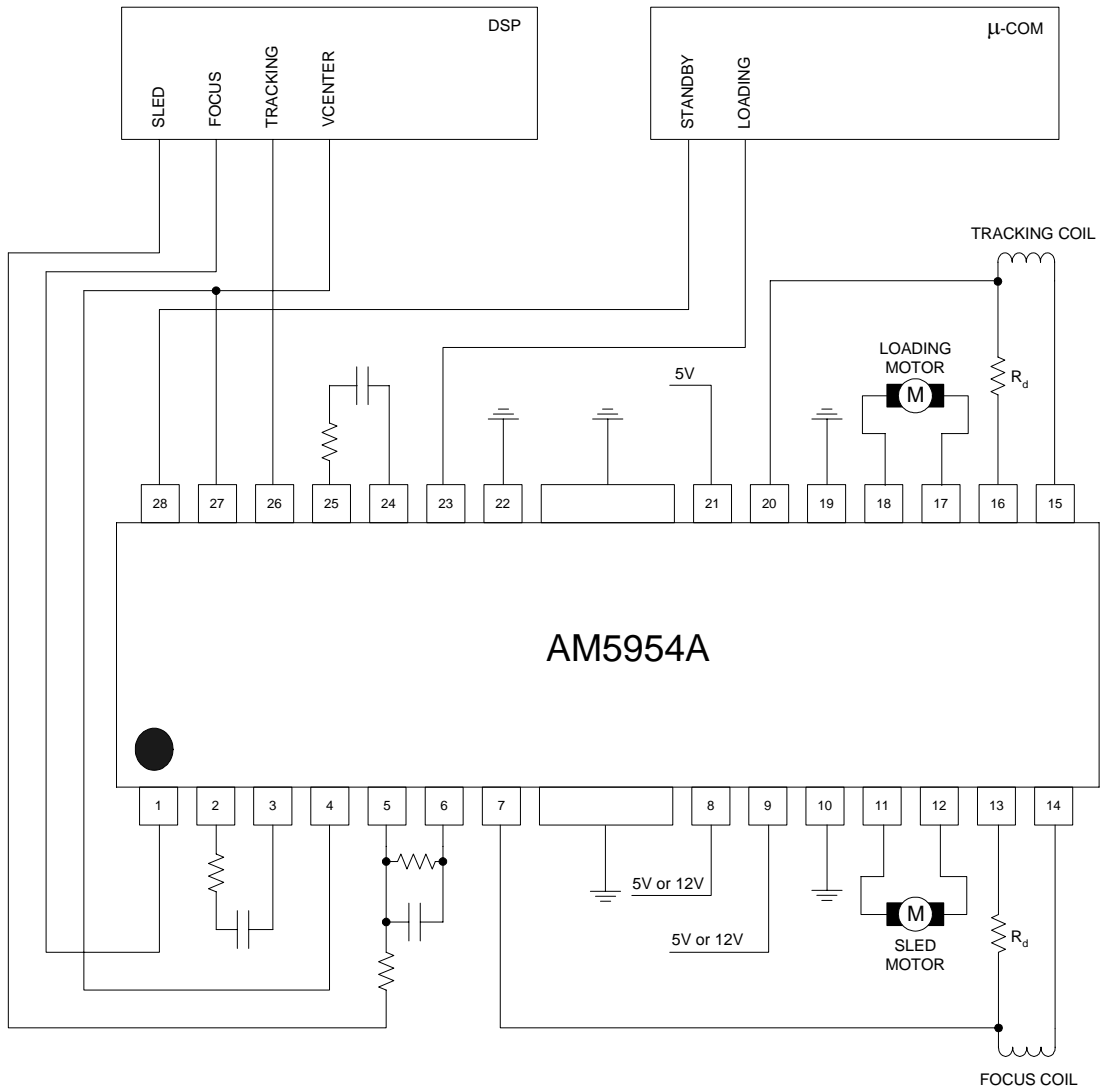


Figure 11. Typical Application of AM5954A in DVD Player

**4-CHANNEL BTL MOTOR DRIVER FOR DVD****AM5954A****Application Information**

1. This IC has a built-in thermal shutdown circuit that mutes the output current when the chip temperature reaches 178°C (Typ). The hysteresis is set to 25°C (Typ), so the driver circuits start up again when the chip temperature falls to 153°C (Typ).
2. The driver buffer is switched off when the supply voltage falls below 3.5V (Typ), and is switched back on when the voltage reaches 3.7V (Typ) again.
3. In case standby pin voltage is under 0.5V or opened, quiescent current is muted. Standby pin voltage should be over 2.0V for normal application.
4. BIAS pin (pin 27) should be pulled up more than 1.2V. In case bias pin voltage is pulled down under 0.9V (Typ), output current is muted.
5. Insert the by-pass capacitor (approximately 0.1μF) between V<sub>CC</sub>-pin and GND-pin as near as possible to this IC.
6. Heat dissipation fins are attached to the GND inside the package. Make sure to connect them to the external GND.

Supplement: (Current-feedback driver)

The transmission gain (output current/input voltage) is given by:

$$gm=1/(R_D + R_{WIRE}) (A/V)$$

R<sub>WIRE</sub> is the total gold wire resistance inside the package (0.15Ω ± 0.05Ω ) (Typ).



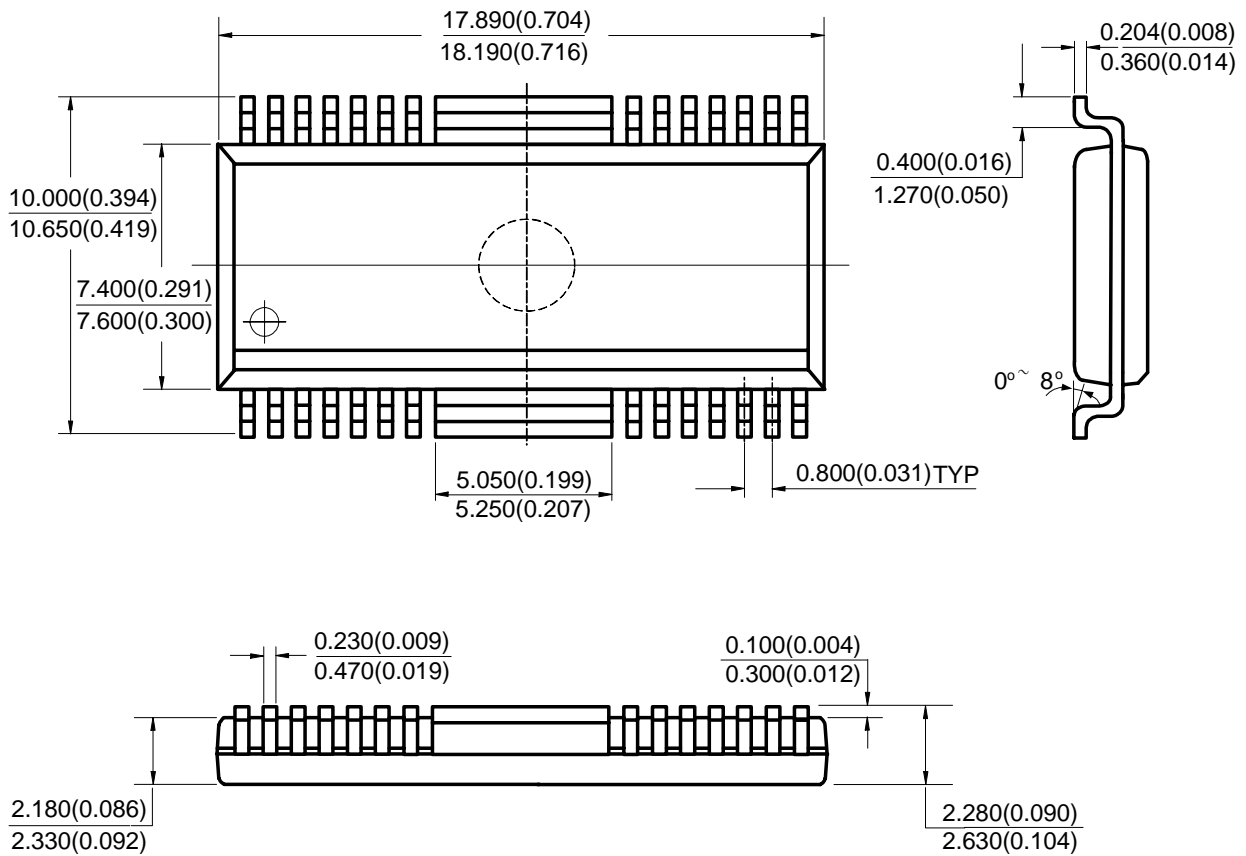
**4-CHANNEL BTL MOTOR DRIVER FOR DVD**

**AM5954A**

**Mechanical Dimensions**

**HSOP-28**

**Unit: mm(inch)**





BCD Semiconductor Manufacturing Limited

<http://www.bcdsemi.com>

#### IMPORTANT NOTICE

BCD Semiconductor Manufacturing Limited reserves the right to make changes without further notice to any products or specifications herein. BCD Semiconductor Manufacturing Limited does not assume any responsibility for use of any its products for any particular purpose, nor does BCD Semiconductor Manufacturing Limited assume any liability arising out of the application or use of any its products or circuits. BCD Semiconductor Manufacturing Limited does not convey any license under its patent rights or other rights nor the rights of others.

---

#### MAIN SITE

**BCD Semiconductor Manufacturing Limited**  
- Wafer Fab  
Shanghai SIM-BCD Semiconductor Manufacturing Limited  
800, Yi Shan Road, Shanghai 200233, China  
Tel: +86-21-6485 1491, Fax: +86-21-5450 0008

**BCD Semiconductor Manufacturing Limited**  
- IC Design Group  
Advanced Analog Circuits (Shanghai) Corporation  
8F, Zone B, 900, Yi Shan Road, Shanghai 200233, China  
Tel: +86-21-6495 9539, Fax: +86-21-6485 9673

#### REGIONAL SALES OFFICE

**Shenzhen Office**  
Shanghai SIM-BCD Semiconductor Manufacturing Co., Ltd. Shenzhen Office  
Advanced Analog Circuits (Shanghai) Corporation Shenzhen Office  
27B, Tower C, 2070, Middle Shen Nan Road, Shenzhen 518031, China  
Tel: +86-755-8368 3987, Fax: +86-755-8368 3166

**Taiwan Office**  
BCD Semiconductor (Taiwan) Company Limited  
4F, 298-1, Rui Guang Road, Nei-Hu District, Taipei,  
Taiwan  
Tel: +886-2-2656 2808, Fax: +886-2-2656 2806

**USA Office**  
BCD Semiconductor Corporation  
3170 De La Cruz Blvd., Suite 105, Santa Clara,  
CA 95054-2411, U.S.A  
Tel: +1-408-988 6388, Fax: +1-408-988 6386