

ML5954 4-channel BTL driver for CD-ROM Driver & DVD Player

❖ Application

- ◆ CD-ROM Driver
- ◆ DVD player

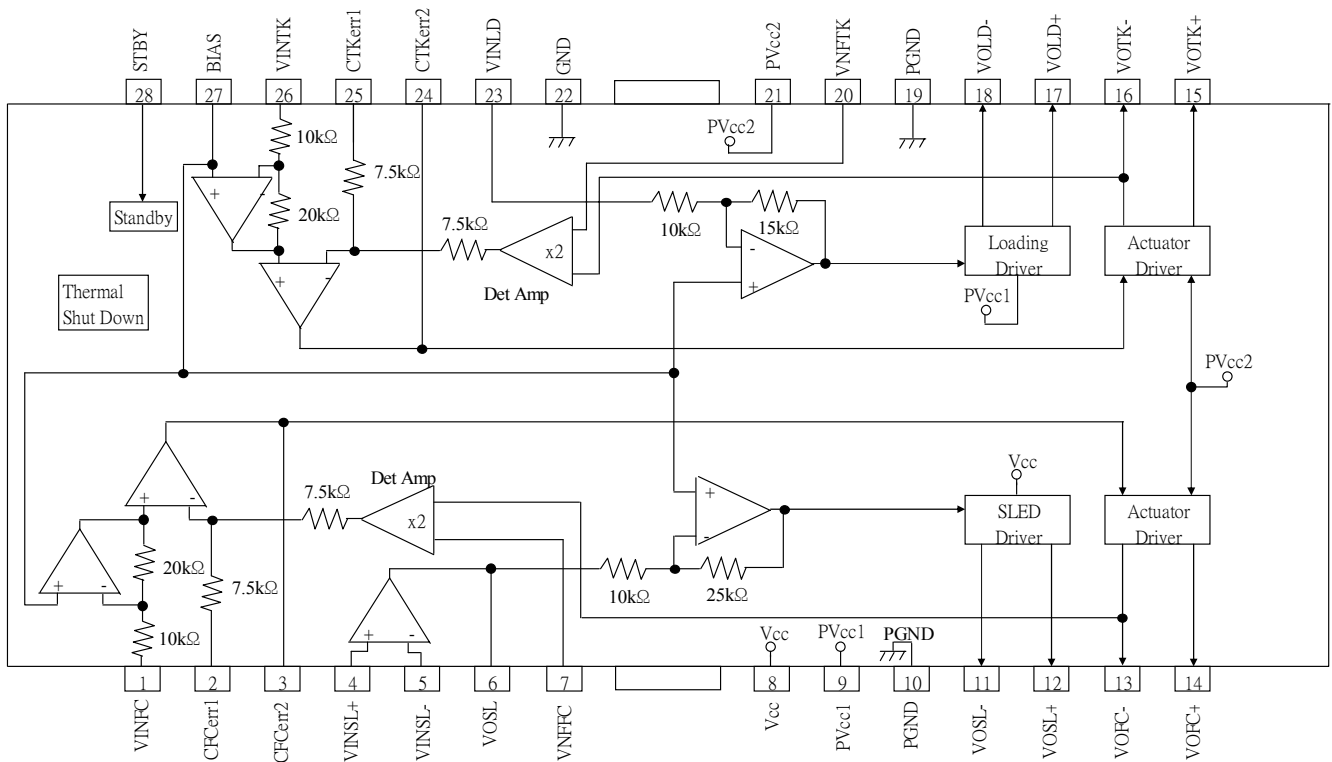
❖ Features

- Wide Dynamic Range (4.0V(Typ.) When $V_{CC}=12V$, $PV_{CC}=5V$ and $R_L=8\Omega$)
- Level Shift Circuit on-chip
- Thermal Shutdown Circuit on-chip
- Internal Standby Mode.
- HSOP-28 package

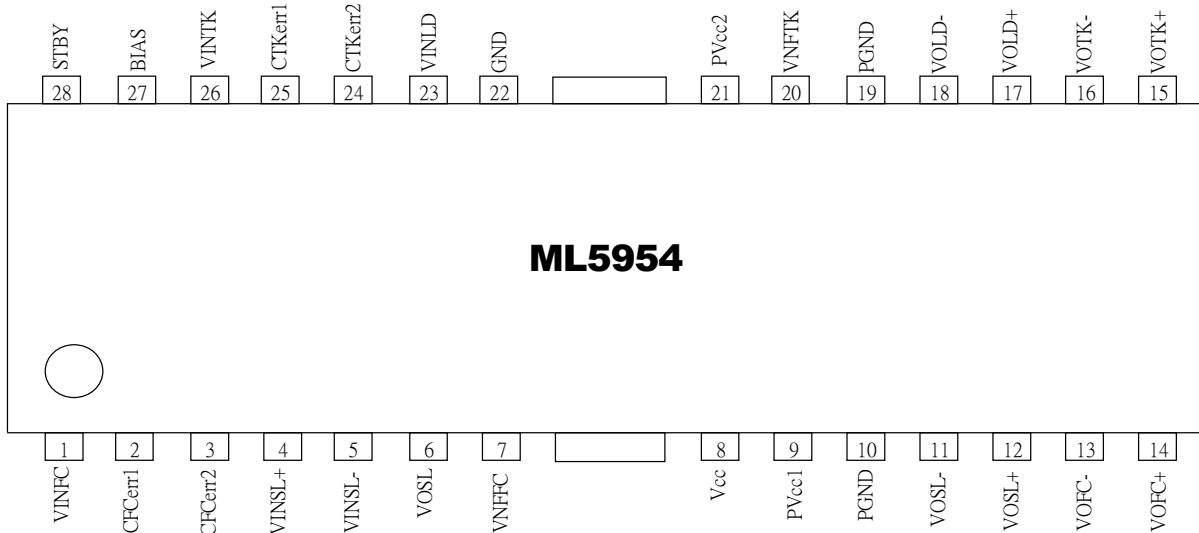
❖ General Description

The ML5954 is a four-channel BTL driver IC for driving the motors and actuators in products such as CD-ROM and DVD. Two channels use current feedback to minimize the current phase shift caused by the influence of load inductance. The IC is used in CD-ROM drivers and DVD players.

❖ Block Diagram



❖ **Pin Configuration**



❖ **Pin Description**

Pin	Pin Name	Function	Pin	Pin Name	Function
1	VINFC	Focus driver input	15	VOTK+	Tracking driver output (+)
2	CFCerr1	For connection of capacitor for the error amp filter	16	VOTK-	Tracking driver output (-)
3	CFCerr2	For connection of capacitor for the error amp filter	17	VOLD+	Loading driver output (+)
4	VINSL+	Op Amp input (+) for the sled driver	18	VOLD-	Loading driver output (-)
5	VINSL-	Op Amp input (-) for the sled driver	19	PGND	Ground for actuator driver block
6	VOSL	Op Amp output for the sled driver	20	VNFTK	Tracking driver feedback pin
7	VNFFC	Focus driver feedback pin	21	PV _{CC2}	Power supply voltage for actuator driver block
8	V _{CC}	Supply voltage	22	GND	Ground
9	PV _{CC1}	Power supply voltage for sled driver block	23	VINLD	Loading driver input
10	PGND	Ground for sled driver block	24	CTKerr2	For connection of capacitor for the error amp filter
11	VOSL-	Sled driver output (-)	25	CTKerr1	For connection of capacitor for the error amp filter
12	VOSL+	Sled driver output (+)	26	VINTK	Tracking driver input
13	VOFC-	Focus driver output (-)	27	BIAS	Bias input
14	VOFC+	Focus driver output (+)	28	STBY	Standby control

Note 1: The indicated polarity for the output pins is defined under the inputs are (+) polarity. The output H bridge power supply pins are PV_{CC2} for the focus & tracking channel, PV_{CC1} for the loading channel, and V_{CC} for the pre-block and sled channel. Always ensure that V_{CC} ≤ PV_{CC1/2}.

❖ Absolute Maximum Ratings

Parameter	Symbol	Ratings	Units
Supply Voltage	VCC, PV _{CC1/2}	13.5	V
Power Dissipation	Pd	1.7 * ¹	W
Storage Temperature	Tstg	-55 ~ +150	°C

Note 1 : Power dissipation is reduced by 5mW for each increase in T_A of 1 °C over 25 °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.

❖ Recommended operating conditions

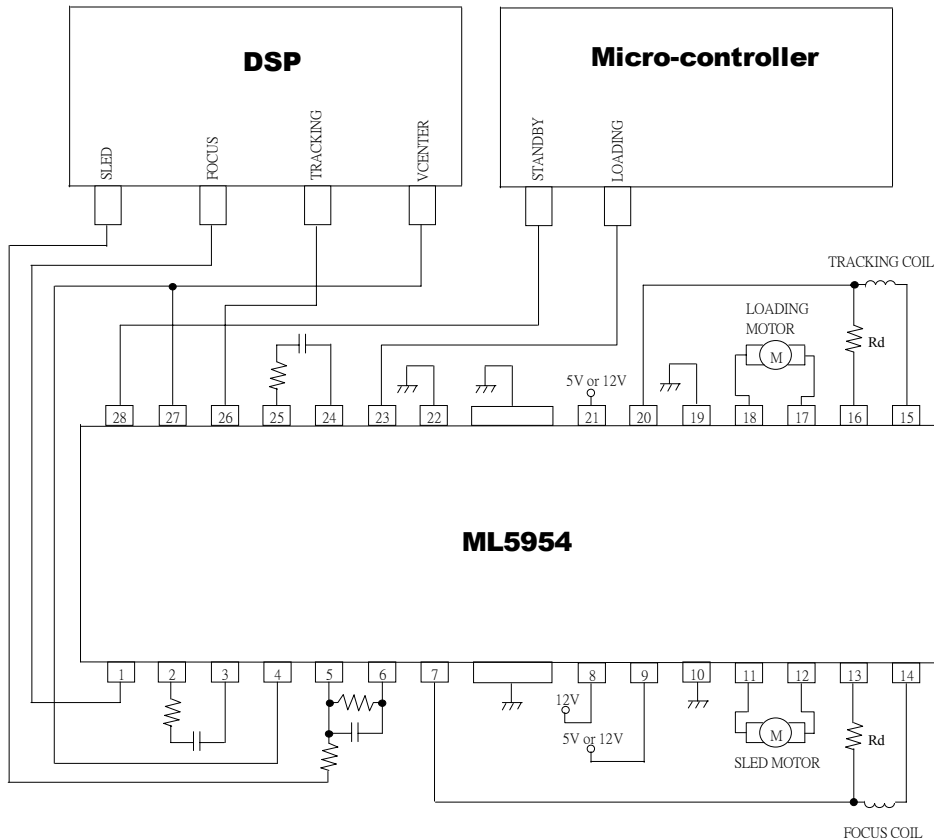
Parameter	Symbol	Ratings	Units
Operating Temperature	T _{OPR}	0 ~ +70	°C
Supply Voltage	V _{CC}	4.3 ~ 13.2	V
	PV _{CC1}	4.3 ~ V _{CC}	V
	PV _{CC2}	4.3 ~ V _{CC}	V

❖ Electrical Characteristics

($T_A=25^\circ\text{C}$, $V_{CC}=12\text{V}$, $PV_{CC1}=PV_{CC2}=5\text{V}$, $V_{BIAS}=2.5\text{V}$, $R_{L1}=R_{L2}=R_{L3}=R_{L4}=8\Omega$, unless otherwise specified.)

<i>Parameter</i>	<i>Symbol</i>	<i>Conditions</i>	<i>Min</i>	<i>Typ</i>	<i>Max</i>	<i>Units</i>
Quiescent Current	I_{CC}			18	27	mA
Standby Current	I_{ST}				0.5	mA
Standby on Voltage	V_{STON}	All channel on			0.5	V
Standby off Voltage	V_{STOFF}	All channel off	2.0			V
<i>Actuator driver</i>						
Output Offset Current	I_{OO}		-6		6	mA
Maximum Output Amplitude	V_{OM}	$V_{IN}=V_{BIAS} \pm 1.5\text{V}$	3.6	4.0		V
Transmission Gain	gm	$V_{IN}=V_{BIAS} \pm 0.2\text{V}$	1.3	1.5	1.7	A/V
<i>Sled Motor Driver / Pre Op-Amp</i>						
Common Input Voltage Range	V_{ICM}		-0.3		11.0	V
Input Bias Current	I_{IB}			30	300	nA
Output Low Level Voltage	V_{OL}	No Load		0.8	1.1	V
Output Source Current	I_{SO}		0.3	0.5		mA
Output sink Current I_{SI}	I_{SI}		1			mA
<i>Sled Motor Driver</i>						
Output Offset voltage	V_{OOFSL}		-100	0	100	mV
Maximum Output Voltage	V_{OMSL}		7.5	9.0		V
Closed-Loop Voltage Gain	G_{VSL}	$V_{IN}=V_{BIAS} \pm 0.2\text{V}$	18.0	20.0	22.0	dB
<i>Loading Motor Driver</i>						
Output Offset Voltage	V_{OOFLD}		-50	0	50	mV
Maximum Output Voltage	V_{OMLD}		3.6	4.0		V
Closed-Loop	G_{VLD}	$V_{IN}=V_{BIAS} \pm 0.2\text{V}$	13.5	15.5	17.5	dB
Gain Error by Polarity	ΔG_{VLD}	$V_{IN}=V_{BIAS} \pm 0.2\text{V}$	0	1	2	dB

❖ **Application Circuit**



Precautions for use

- (1) This IC has a built-in thermal shutdown circuit that mutes the output current when the chip temperature reached 175°C (Typ). The hysteresis is set to 25 °C (Typ.), so the driver circuits start up again when the chip temperature falls to 150 °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 under 1.4V or opened, quiescent current is muted. Standby pin voltage should be over 1.8V for normal application.
- (4) Insert the by-pass capacitor between V_{CC}-pin and GND-pin of the IC as near as possible (approximately 0.1uF)
- (5) Heat dissipation fins are attached to the GND on the inside of the package. Make sure to connect these to the external GND.

Supplement: (Current-feedback driver)

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

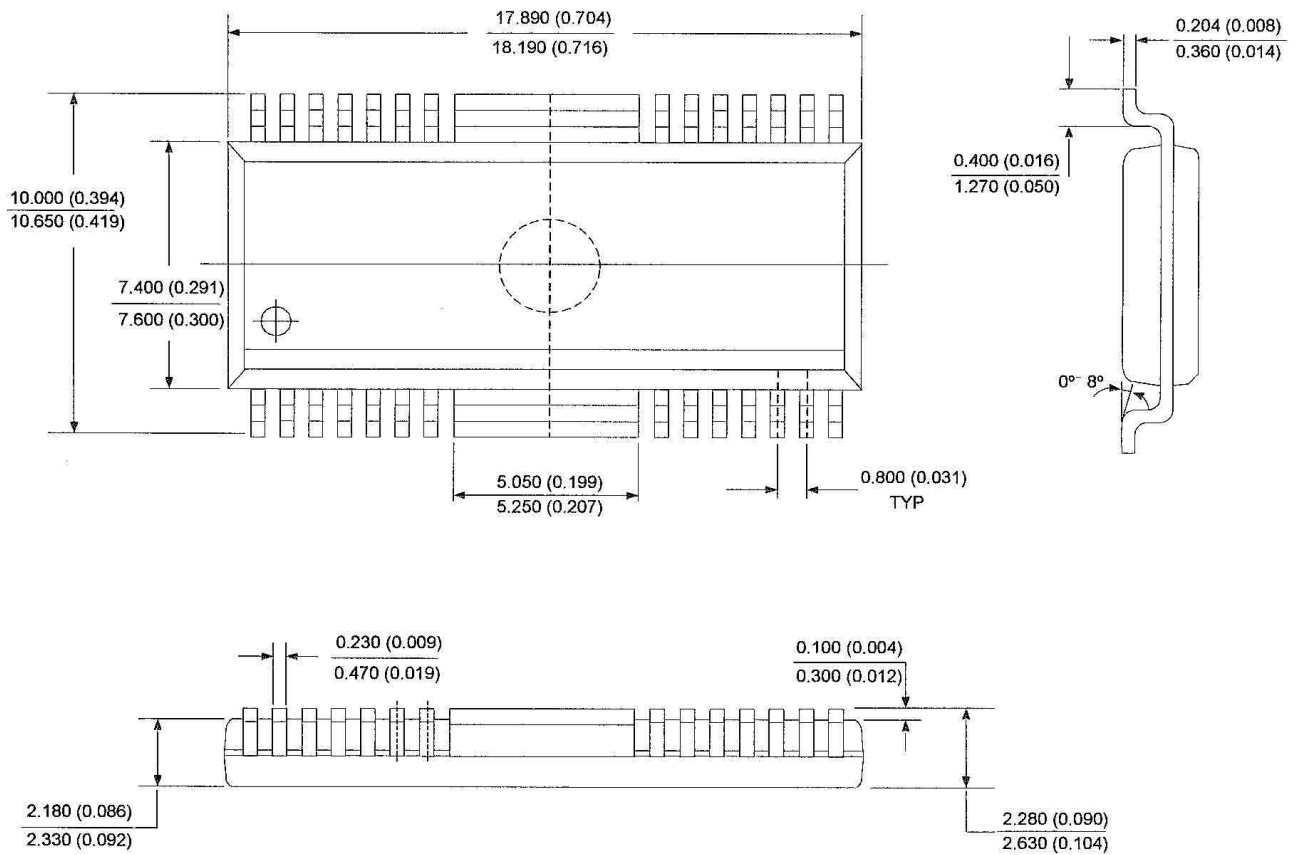
$$gm = \frac{1}{(Rd + R_{WIRE})} (A/V)$$

,where R_{WIRE} is the total gold wire resistance inside the package (0.15Ω ± 0.05Ω) (Typ.).

❖ *Mechanical Dimensions*

HSOP-28

Unit: mm (inch)



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