4-channel BTL Driver for CD-ROM Driver
AM5954

The AM5954 is a four-channel BTL driver IC for driving the motors and actuators such as used in CD-ROM drives. Two of the channels use current feedback to minimize the current phase shift caused by the influence of loading inductance.

● Applications

BTL driver for CD, CD-ROM and DVD.

● Features

1) Two channels are current-type BTL drivers for actuators for tracking and focus, two channels are voltage-type BTL driver for sled and loading motors.
2) Wide dynamic range [9.0V(*typ*) when Vcc=PVcc=12V, at R_L=8Ω load].
3) Separating power of Vcc and PVcc to improve power efficiency by a low supply voltage for tracking and focus.
4) Level shift circuit built-in.
5) Thermal shut down circuit built-in.
6) Standby mode built-in.
7) **Dual actuator drivers:**
   The drivers use current feedback to minimize the current phase shift caused by the influence of the load inductance. The output structure are two power OPAMPS in bridge configuration.
8) **Sled motor driver:**
   A general purpose input OP provides differential input for signal addition. The output structure are two power OPAMPS in bridge configuration.
9) **Loading driver:**
   Single input linear BTL driver. The output structure are two power OPAMPS in bridge configuration.

● Absolute maximum ratings (Ta=25°C)

Parameter	Symbol	Limits	Unit
Supply voltage	Vcc PVcc1 PVcc2	13.5	V
Power dissipation	P_d	*1.7	W
Operate Temp range	T_{opr}	-35 ~ +85	℃
Storage Temp range	T_{stg}	**-55 ~ +150	℃

*When mounted on a 70mm×70mm×1.6mm glass epoxy board.

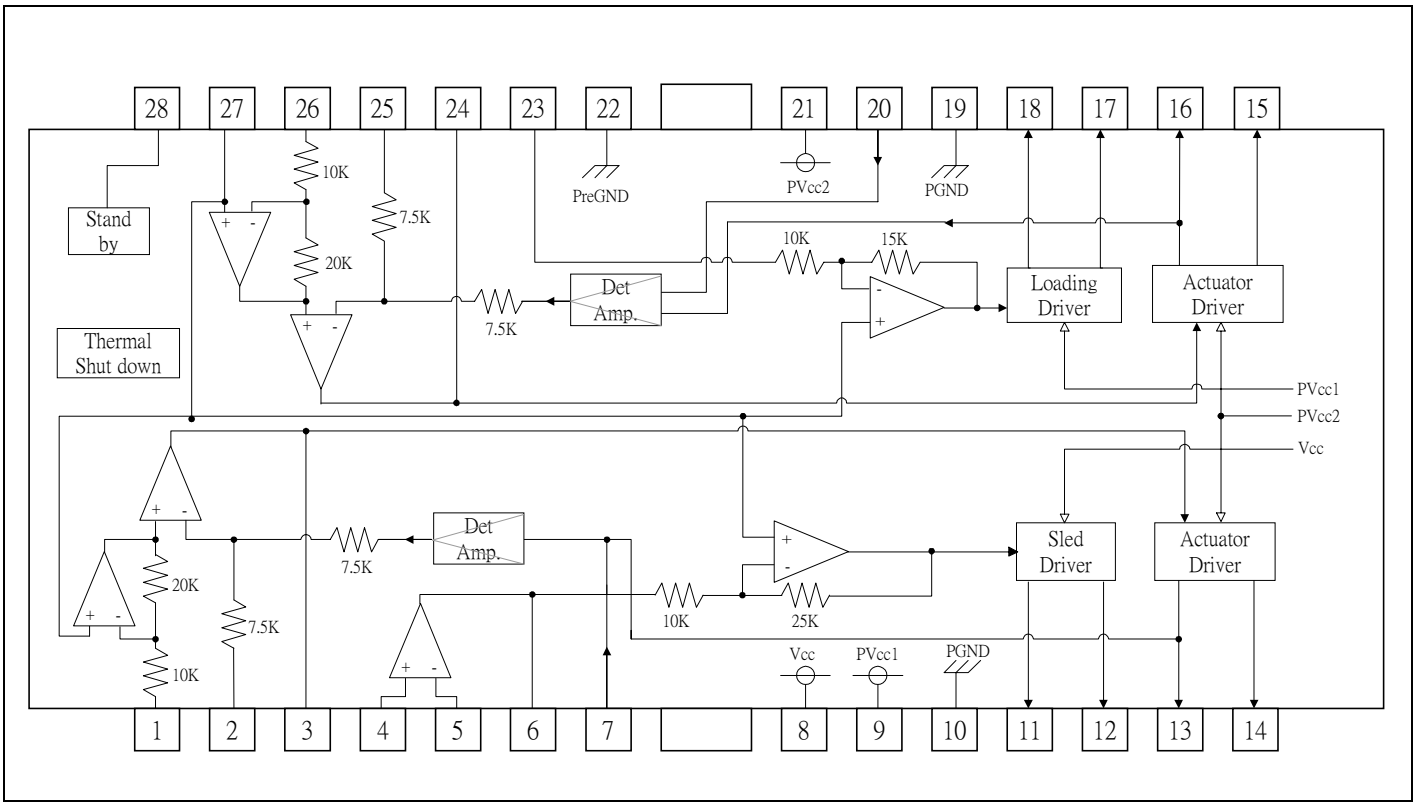
*Reduced by 13.6mW for each increase in T_a of 1℃ over 25℃.

**Should not exceed Pd or ASO and T_j=150 ˚C values

- **Guaranteed operating conditions (Ta=25°C)**

Parameter	Symbol	Limits	Unit
Power supply voltage	Vcc	4.3 ~ 13.2	V
	PVcc1 PVcc2	4.3 ~ Vcc	V

- **Block diagram**



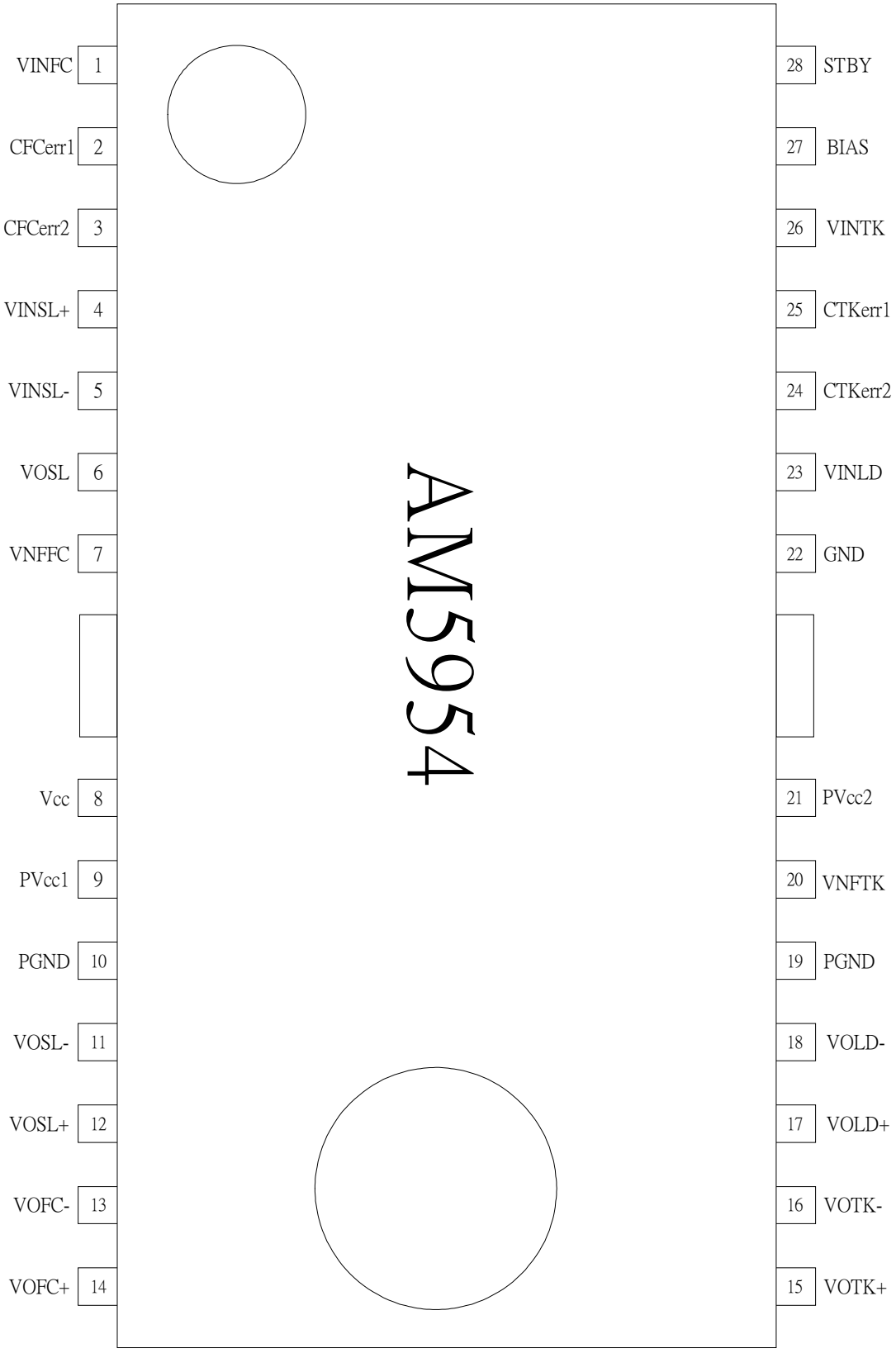
● Electrical characteristics

(Unless otherwise specified T_a=25℃, Vcc=12V, PVcc1=PVcc2=5V, BIAS=2.5V, R_L=8Ω/10Ω, R_d=0.5Ω, C=100pF)

Parameter	Symbol	Limit			Unit	Conditions	P.S
		Min	Typ	Max			
Quiescent current	I_{cc}	-	18	27	mA		
Standby quiescent current	I_{st}	-	-	0.5	mA		
Voltage for standby ON	V_{ston}	0	-	0.5	V		
Voltage for standby OFF	V_{stoff}	2.0	-	5	V		
<Actuator drivers>							
Output offset current	I_{oo}	-	-	±6	mA		
Maximum output voltage	V_{om}	3.6	4.0	-	V	@10ΩLoad	
Transconductance	gm	-	1/Rd	-	A/V	VIN=BIAS+0.2Vpp ac @1KHz	
<Sled motor driver/Pre OPAMP>							
Common mode input range	V_{icm}	1	-	10	V		
Input current	I_{ib}	-	-50	-300	nA		
Low level output voltage	V_{olop}	-	0.1	0.3	V	@1mA	
High level output voltage	V_{olop}	11	11.3		V	@-0.3mA	
Output source current	I_{src}	0.3	0.5	-	mA		
Output sink current	I_{sink}	1	2	-	mA		
<Sled motor driver>							
Output offset voltage	V_{oofsl}	-	-	±100	mV		
Maximum output voltage	V_{omsl}	7.5	9.0	-	V	@8Ω Load	
Closed loop voltage gain	G_{vsl}	18	20	22	dB	VIN=BIAS+0.2Vpp ac @1KHz	
<Loading motor driver>							
Output offset voltage	V_{oofld}	-	-	±50	mV		
Maximum output voltage	V_{omax}	3.6	4.0	-	V	@8Ω Load	
Voltage gain	G_{vld}	13.3	15.5	17.5	dB	VIN=BIAS+0.2Vpp ac @1KHz	
Gain error by polarity	ΔG_{vld}	0	1	2	dB	VIN=BIAS+0.2Vpp ac @1KHz	

*****This device is not designed for protection against radioactive rays.

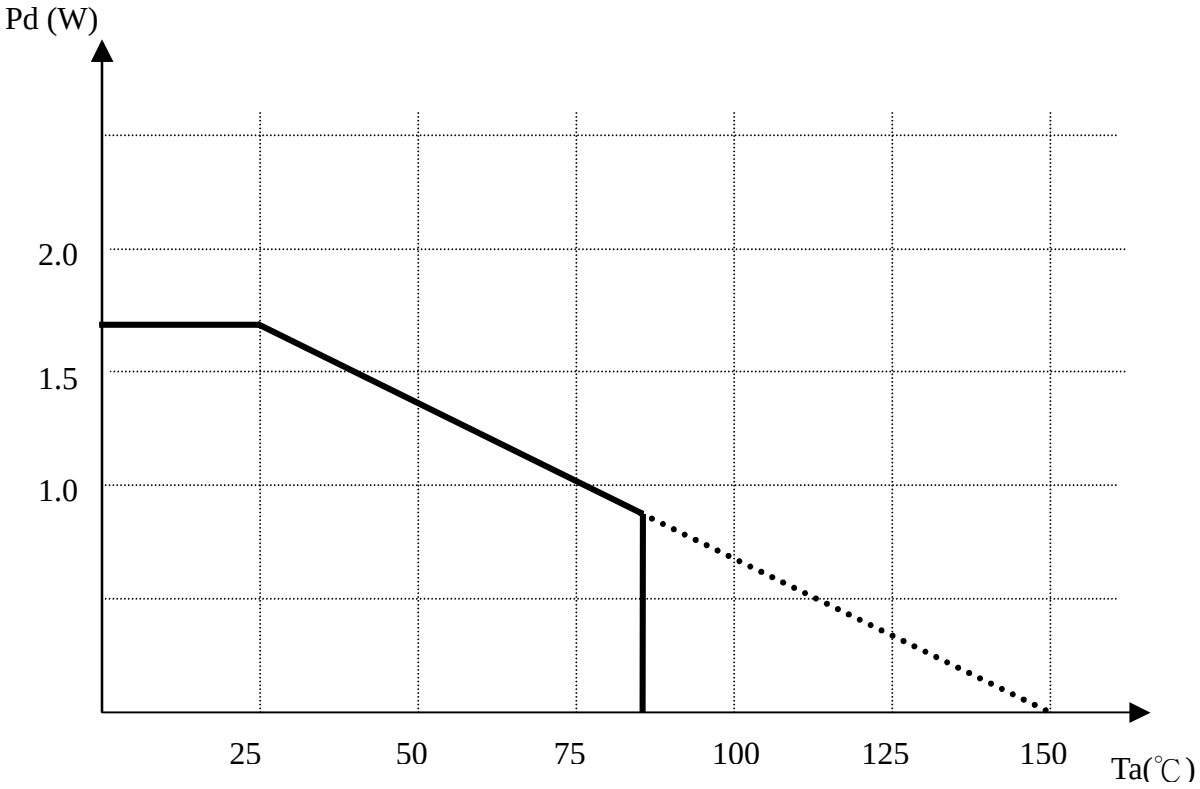
- **Pin configuration**



● Pin description

PIN No	Pin Name	Function
1	VINFC	Input for focus driver
2	CFCerr1	Connection of capacitor for the error amp filter
3	CFCerr2	Connection of capacitor for the error amp filter
4	VINSL+	OPAMP input (+) for the sled driver
5	VINSL-	OPAMP input (-) for the sled driver
6	VOSL	OPAMP output for the sled driver
7	VNFFC	Focus driver feedback pin
8	Vcc	Vcc for pre-drive block and power block of sled
9	PVcc1	Vcc for power block of loading
10	PGND	GND for power 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	GND for power block
20	VNFTK	Feedback for tracking driver
21	PVcc2	Vcc for power block of tracking and focus
22	GND	GND for pre-drive block
23	VINLD	Input for loading driver
24	CTKerr2	Connection of capacitor for the error amp filter
25	CTKerr1	Connection of capacitor for the error amp filter
26	VINTK	Input for tracking driver
27	BIAS	Input for reference voltage
28	STBY	Input for standby control

- **Power dissipation curve :**



*70mm×70mm×1.6mm glass epoxy board.

*Debating in done at 17.6mW/℃ for operating above T_a=25℃

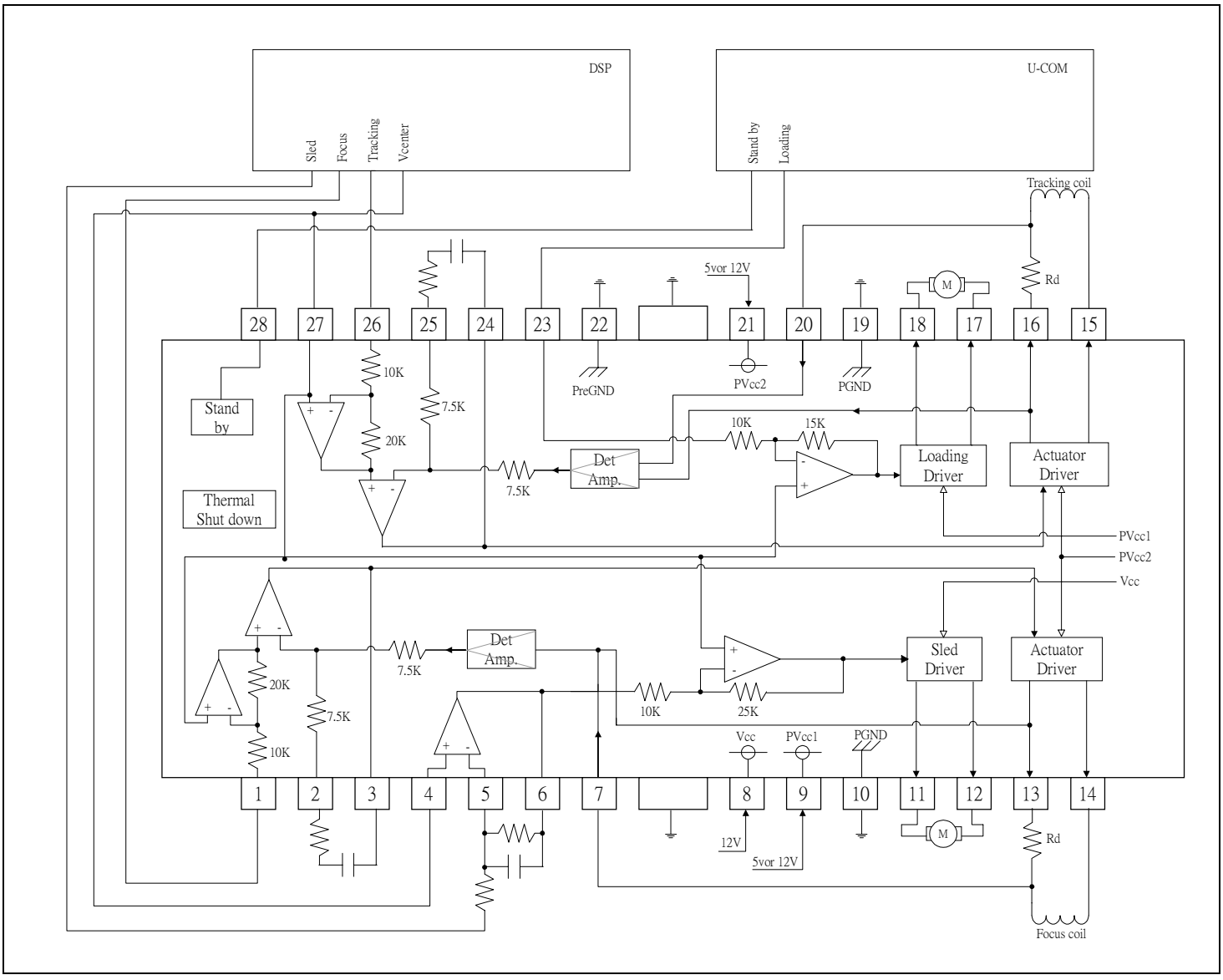
- **Operation notes**

1) The built-in thermal shutdown circuit mutes the output current when the chip temperature reaches 175℃ (typ). The hysteresis is set to 25℃ (typ), so the circuit will start up again when the chip temperature falling to 150℃ (typ).
2) In case standby pin voltage is below 0.5V or NC, quiescent current is muted. Standby 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 (~ 0.1uF) between Vcc pin and GND pin as close as possible.
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) Current feedback driver
   Trans conductance (output current / input voltage) is shown as below

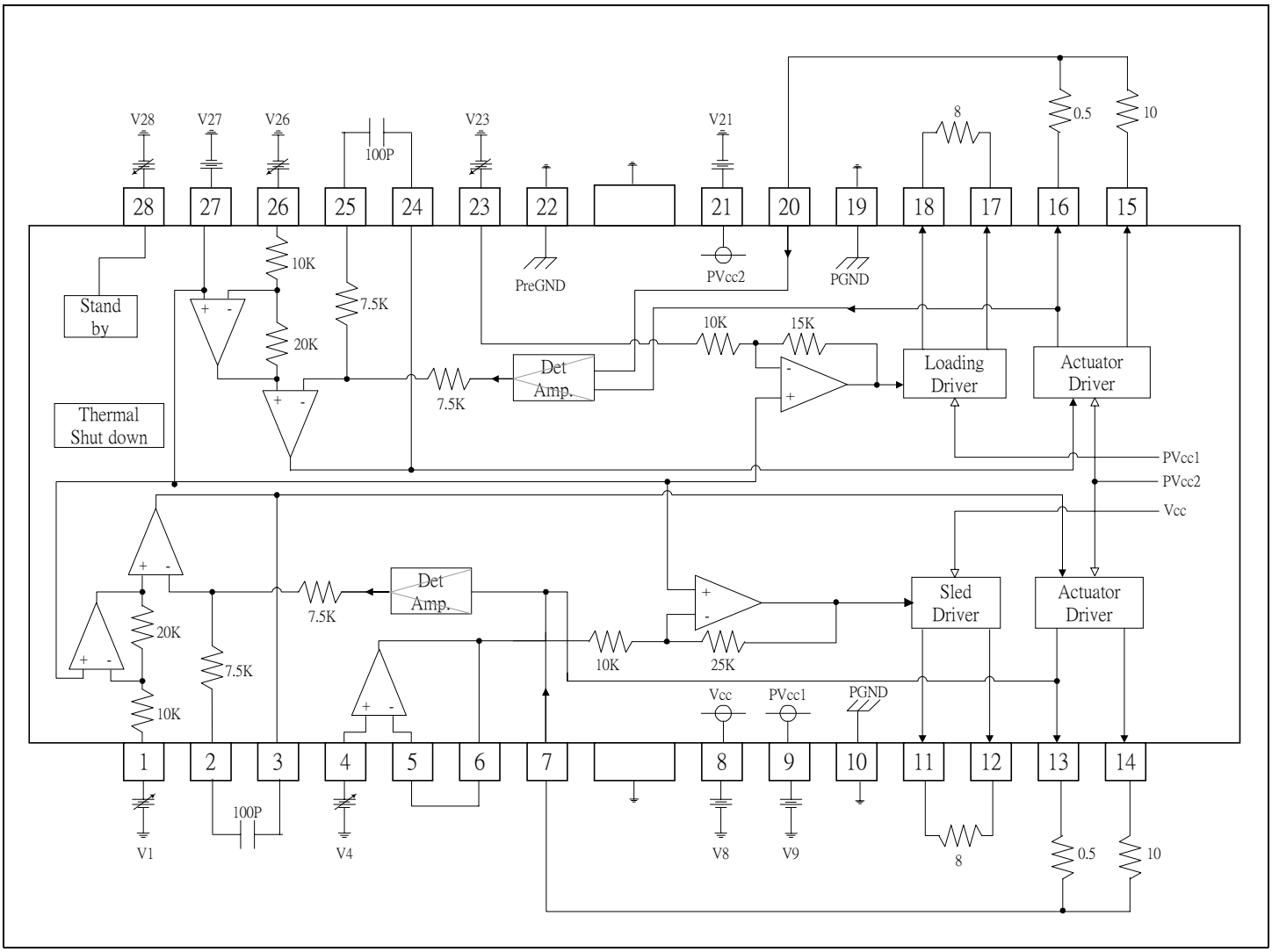
   $G_m = 1 / (R_d + R_{wire})$ (A/V)

   R_{wire} is the total wire resistance inside the package, R_{wire} ~ 0.15Ω ± 0.05Ω (typ)

- **Application circuit**

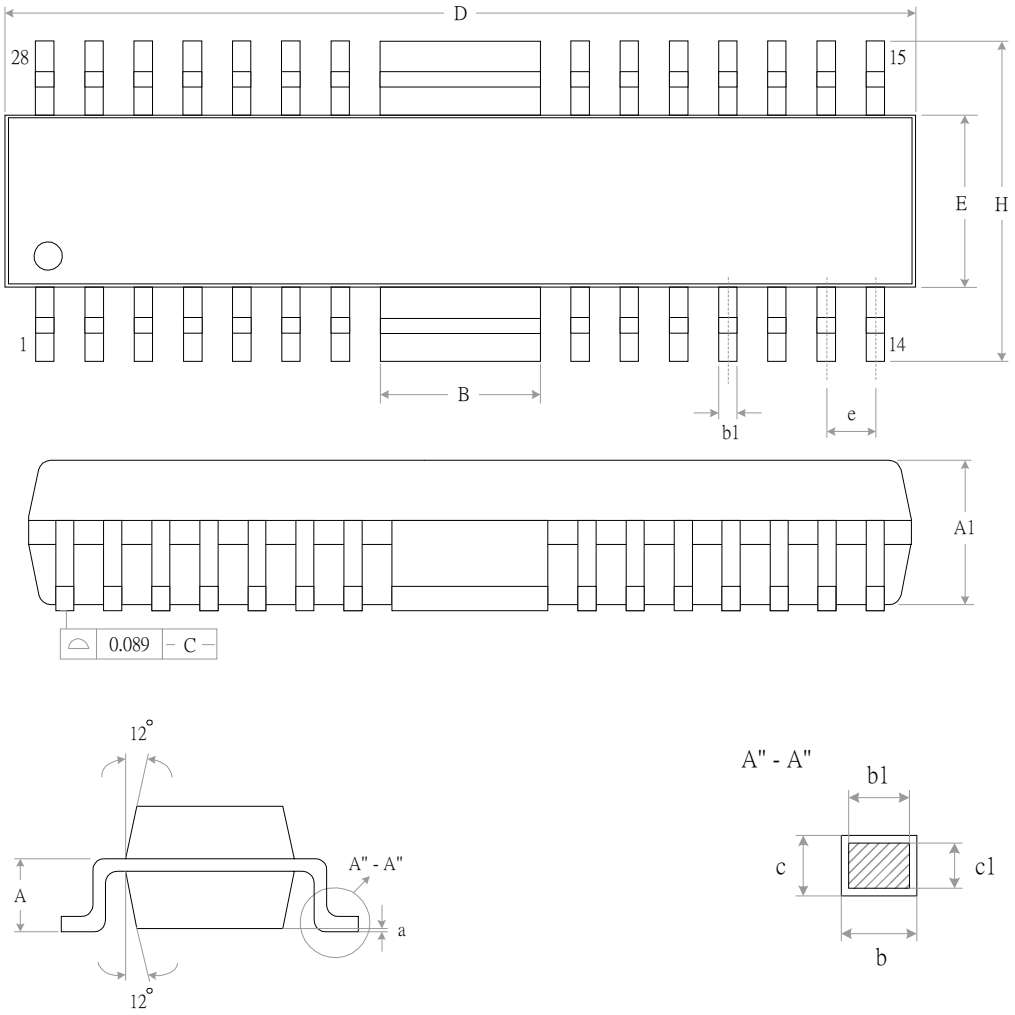


- **Testing circuit**



- **Packaging outline**

HSOP28



SYMBOL	MILLIMETERS		INCHES	
	Min.	Max.	Min.	Max.
A	-	2.31	-	0.091
A1	-	2.20	-	0.087
a	0.05	0.20	0.002	0.008
B	5.05	5.25	0.199	0.207
b	0.30	0.45	0.012	0.018
b1	0.30	0.40	0.012	0.016
c	0.23	0.30	0.009	0.012
c1	0.23	0.28	0.009	0.011
D	18.41	18.67	0.725	0.735
E	7.49	7.75	0.295	0.305
e	0.80 BSC		0.031 BSC	
H	9.62	10.02	0.379	0.394