

TOSHIBA Bipolar Linear Integrated Circuit Silicon Monolithic

# TA8201AK

## BTL Audio Power Amplifier

The TA8201AK is a audio power amplifier for consumer application.

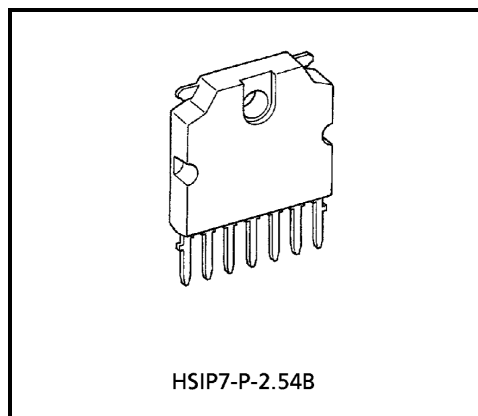
This IC is applying BTL system in which output coupling condenser and bootstrap condenser are not necessary and output 17W ( $V_{CC} = 14.4V$ ,  $B_L = 4\Omega$ , THD = 10%) can be obtained. Since the package is a 7 pin SIP, (signal inline package), it greatly simplifies construction of a power amplifier both in design and assembly.

It also contains various kind of protector.

It is suitable for car-audio power amplifier with high performance.

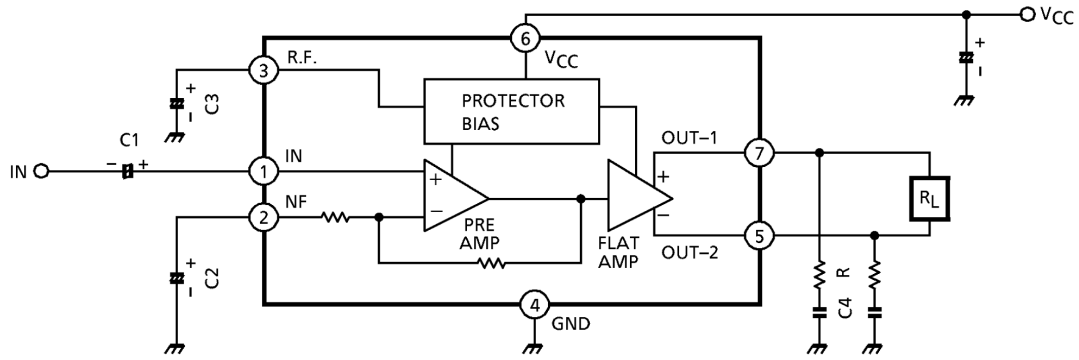
### Features

- High power:  $P_{OUT(1)} = 17W$  (typ.)  
( $V_{CC} = 14.4V$ ,  $f = 1kHz$ , THD = 10%,  $R_L = 4\Omega$ )  
:  $P_{OUT(2)} = 14W$  (typ.)  
( $V_{CC} = 13.2V$ ,  $f = 1kHz$ , THD = 10%,  $R_L = 4\Omega$ )
- Very few external parts
- Built in protector circuit  
Thermal shut down, over voltage protector (typ.  $V_{CC} = 24V$ )  
ASO protector ( $R_L$  short, Out to GND, Out to VCC)
- 7 pin small package
- Operating supply voltage range:  $V_{CC} = 9\sim 18V$



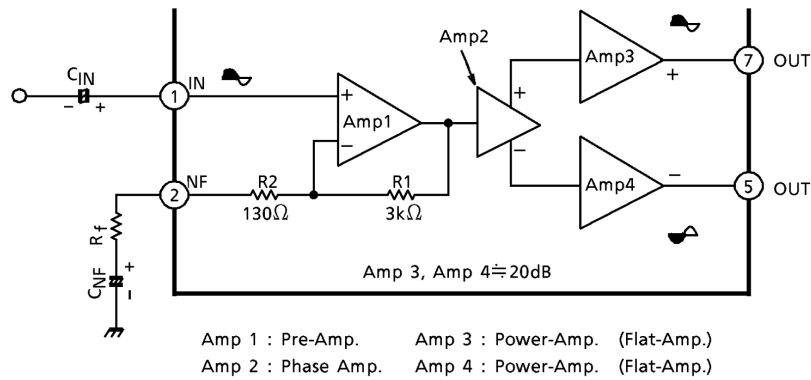
Weight: 2.19g (typ.)

**Block Diagram**



**Directions For Use And Application Method**

1. Voltage gain adjustment



(Fig.1)

This IC has the amplifier construction as shown in Fig.1. The pre-amp. Amp 1 is provided to the primary stage, and the input voltage is amplified by the flat amps, amp 3 and amp 4 of each channel through the phase amp. Amp 2.

Since the input offset is prevented by pre-amp when VCC is set to on, this circuit can remarkable reduce the pop noise.

The total closed loop gain  $G_V$  of this IC can be obtained by expression below when the closed loop voltage gain of amp 1 is  $G_{V1}$ .

$$G_{V1} = 20 \log \frac{R1 + (Rf + R2)}{Rf + R2} \text{ (dB)} \dots\dots (1)$$

The closed loop voltage gain of power amp, amp 3 and amp 4 is fixed at  $G_{V3} \doteq G_{V4} = 20\text{dB}$ .

Therefore, the total closed circuit voltage gain  $G_V$  is obtained through BTL connection by the expression below.

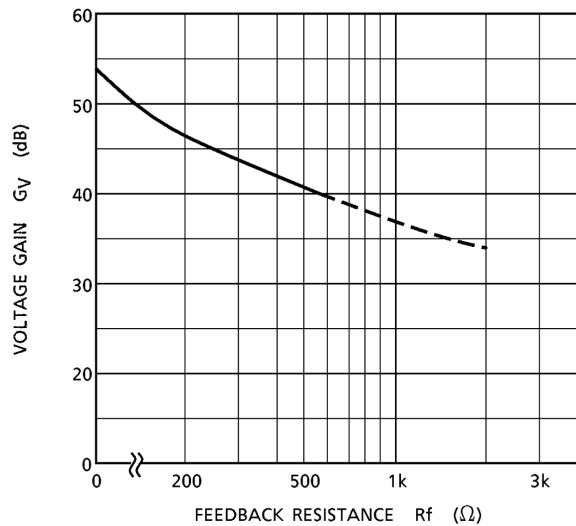
$$G_V = G_{V1} + G_{V3} + 6 \text{ (dB)} \dots\dots\dots (2)$$

For example, when  $R_f = 0\Omega$ , GV is obtained by the expression below.

$$GV \doteq 28+20+6 = 54 \text{ (dB)}$$

The voltage gain is reduced when  $R_f$  is increased. (Fig.2)

With the voltage gain reduced, since (1) the oscillation stability is reduced, and (2) the pop noise changes when VCC is set to on, refer to the items 2 and 4.



(Fig.2)

2. Capacitive value of input and NF capacitor

This IC has the built-in circuit which makes the input voltage of amp. 1 and the voltage of NF terminal equal at VCC → on by means of providing the pre-amp (amp 1) at the first stage.

Therefore, the off-set voltage produced at the first stage is suppressed, and the pop noise is prevented.

Set the capacitive value of input and NF capacitor according to the gain to be used.

[Reference] (A) At  $GV = 54\text{dB}$  ( $R_f = 0$ )  $C_{IN} = 4.7\mu\text{F}$ ,  $C_{NF} = 47\mu\text{F}$

(B) At  $GV = 40\text{dB}$  ( $R_f = 560\Omega$ )  $C_{IN} = 3.3\mu\text{F}$ ,  $C_{NF} = 33\mu\text{F}$

3. Capacitance of ripple filter capacitor

The capacitance of the ripple filter capacitor of (3) pin determines the time constant at VCC → on and VCC → off.

Since the pop noise varies according to the capacitance of the ripple filter capacitor,  $C3 = 220\mu\text{F}$  recommended.

Having the built-in rapid discharging circuit of ripple and NF voltage at the time when VCC → off, this IC is effective for preventing the pop noise of VCC continuous on / off.

#### 4. Preventive measure against oscillation

For preventing the oscillation, it is advisable to use C4, the condenser of polyester film having small characteristic fluctuation of the temperature and the frequency.

The resistance R to be series applied to C4 is effective for phase correction of high frequency, and improves the oscillation allowance.

Since the oscillation allowance is varied according to the causes described below, perform the temperature test to check the oscillation allowance.

- (1) Voltage gain to be used (GV setting)
- (2) Capacity value condenser
- (3) Kind of condenser
- (4) layout of printed board

By increasing Rf, decrease of GV is possible.

However, care must be taken since the feedback increase is liable to produce oscillation.

#### 5 External part list and description

Symbol	Recommended Value	Feature	Influence		Remarks
			Smaller Than Recommended Value	Larger Than Recommended Value	
C1	4.7μF	DC blocking	Related to popping noise at V <sub>CC</sub> → on		Related to gain. Refer to item2.
C2	47μF	Feedback condenser	Related to popping noise at V <sub>CC</sub> → on Determination of low cut-off frequency. $C2 = \frac{1}{2\pi f_L \cdot R_f}$		
C3	220μF	Ripple reduction	Time constant is small at V <sub>CC</sub> → on or off.	Time constant is large at V <sub>CC</sub> → on or off.	Refer to item3.
C4	0.15μF	Oscillation prevention	Made liable to oscillate.	Oscillation allowance improved.	Refer to item4.
C5	1000μF	Ripple filter	For filtering power supply hum and ripple. Large at using AC rectified power supply. Small at using DC power supply.		

## Maximum Ratings (Ta = 25°C)

Characteristic	Symbol	Rating	Unit
Peak supply voltage (0.2 sec)	V <sub>CC</sub> (surge)	50	V
DC supply voltage	V <sub>CC</sub> (DC)	25	V
Operating supply voltage	V <sub>CC</sub> (opr)	18	V
Output current (peak)	I <sub>O</sub> (peak)	4.5	A
Power dissipation	P <sub>D</sub>	15	W
Operating temperature	T <sub>opr</sub>	-30~85	°C
Storage temperature	T <sub>stg</sub>	-55~150	°C

## Electrical Characteristics

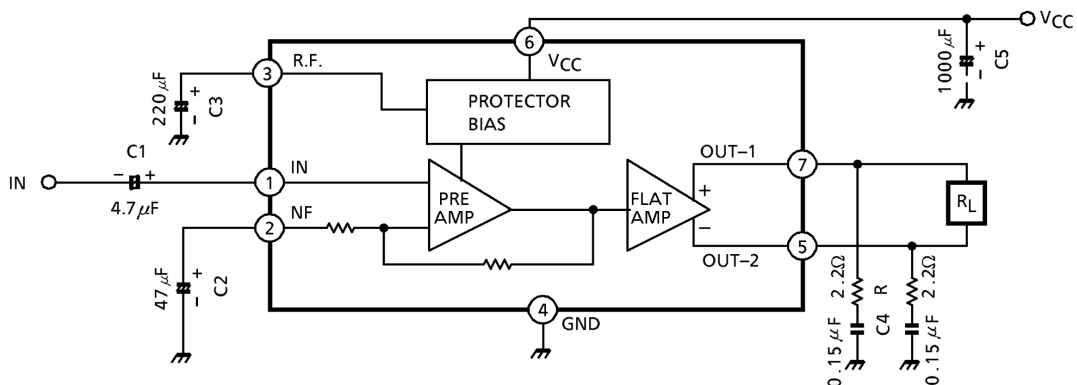
(unless otherwise specified, V<sub>CC</sub> = 13.2V, R<sub>L</sub> = 4Ω, f = 1kHz, Ta = 25°C)

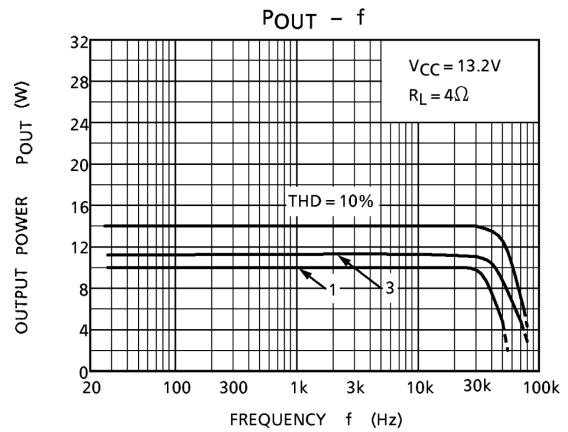
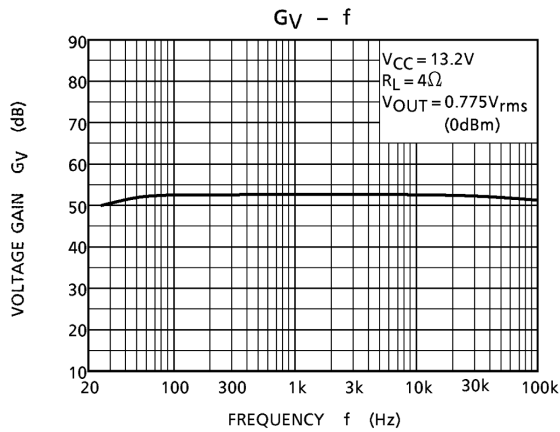
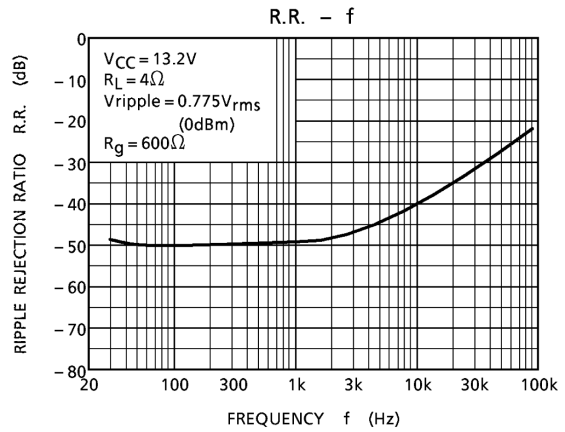
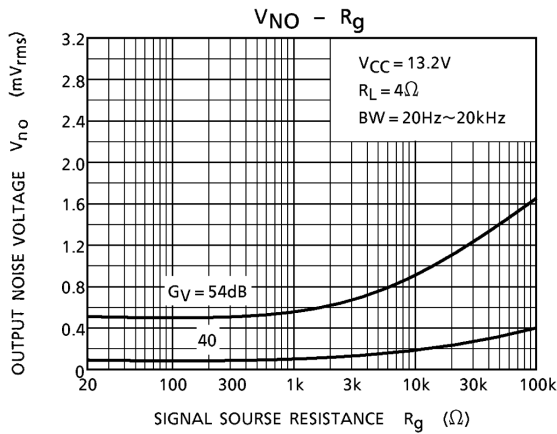
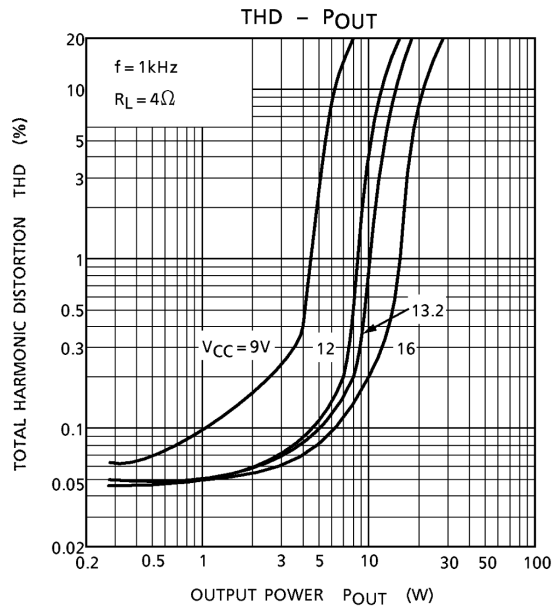
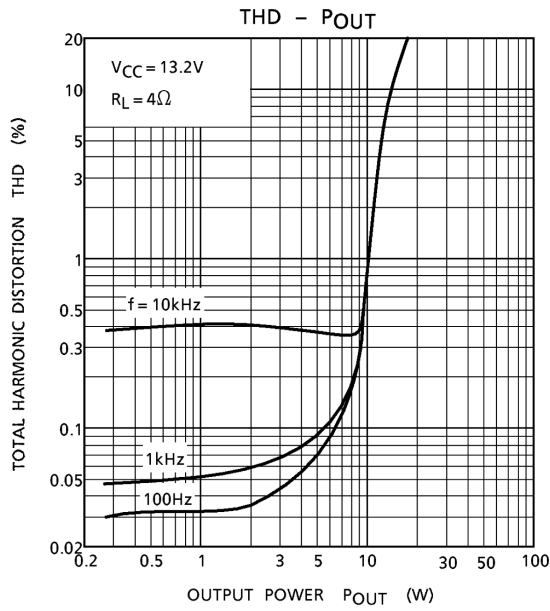
Characteristic	Symbol	Test Circuit	Test Condition	Min.	Typ.	Max.	Unit
Quiescent current	I <sub>CCQ</sub>	—	V <sub>IN</sub> = 0	—	60	95	μA
Output power	P <sub>OUT</sub> (1)	—	V <sub>CC</sub> = 14.4V, THD = 10%	—	17	—	W
	P <sub>OUT</sub> (2)	—	THD = 10%	10	14	—	
Total harmonic distortion	THD	—	P <sub>OUT</sub> = 1W	—	0.05	0.4	%
Voltage gain	G <sub>V</sub>	—	R <sub>f</sub> = 0Ω	52	54	56	dB
Output noise voltage	V <sub>NO</sub>	—	R <sub>g</sub> = 10kΩ, BW = 20Hz~20kHz	—	0.9	2.0	mV <sub>rms</sub>
Ripple rejection ratio	R.R.	—	Fripple = 100Hz, R <sub>g</sub> = 600Ω	40	50	—	dB
Input resistance	R <sub>IN</sub>	—	f = 1kHz	—	30	—	kΩ
Output offset voltage	V <sub>offset</sub>	—	V <sub>IN</sub> = 0	-0.3	0	0.3	V

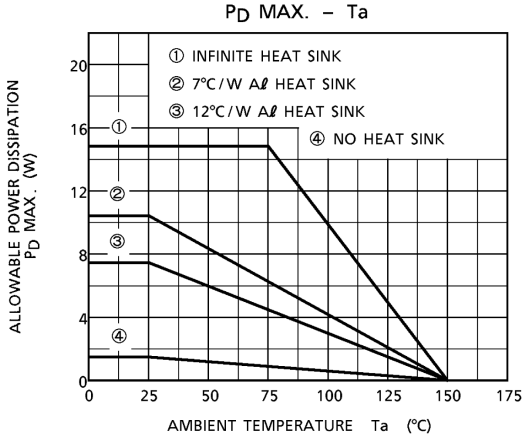
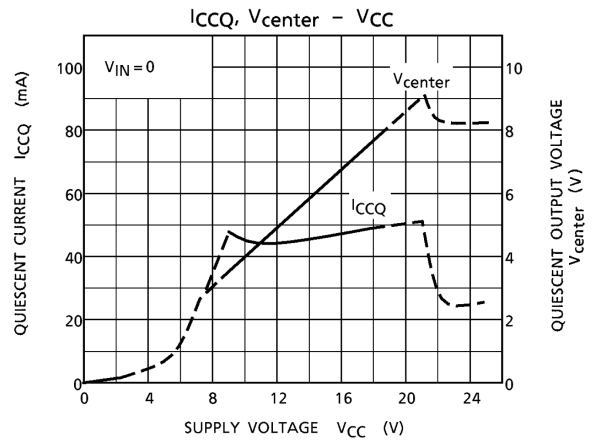
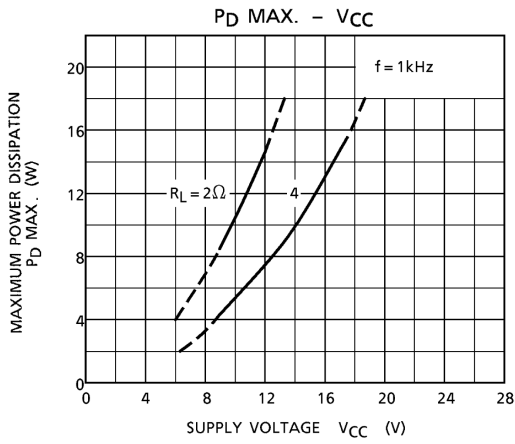
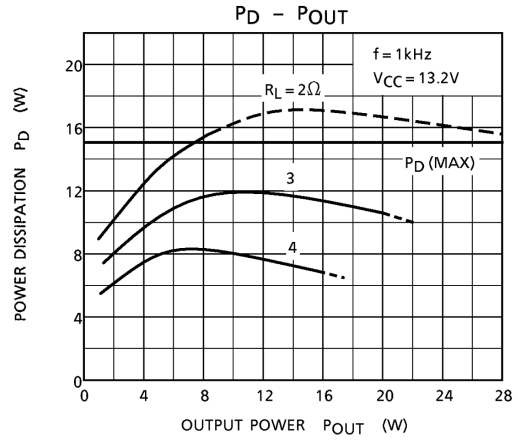
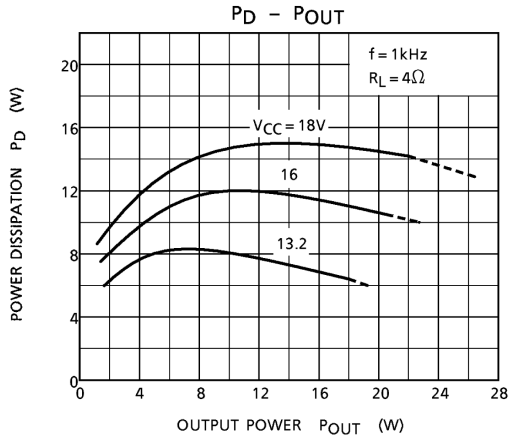
## Typical DC Voltage Of Each Terminal (V<sub>CC</sub> = 13.2V, V<sub>IN</sub> = 0V, Ta = 25°C)

Terminal No.	1	2	3	4	5	6	7
Terminal	In	NF	R.F.	GND	Out	V <sub>CC</sub>	Out
DC voltage (V)	4.55	4.55	4.55	0	5.6	13.2	5.6

## Test Circuit / Application Circuit



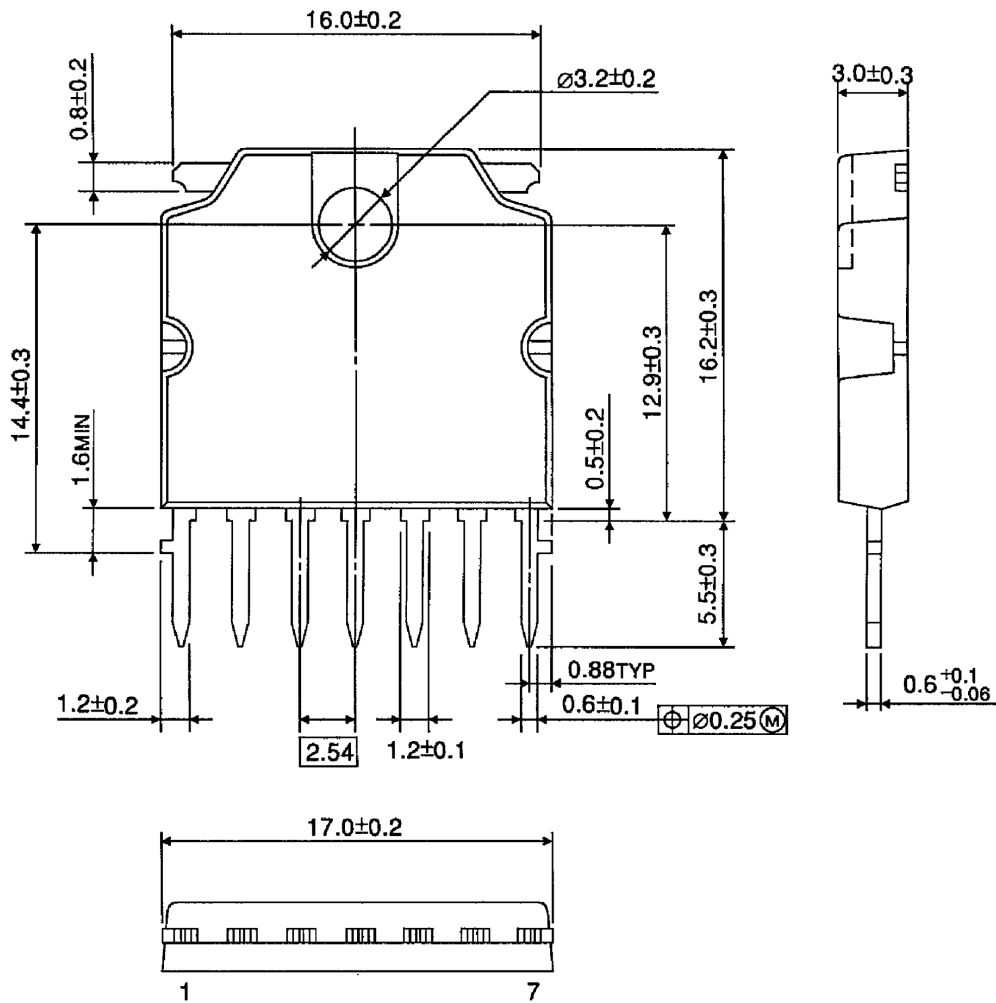




**Package Dimensions**

HSIP7-P-2.54B

Unit : mm



Weight: 2.19g (typ.)



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