# AN8388S, AN8388SR

## 4 Ch. Linear Driver IC for CD Player

### ■ Overview

The AN8388S and AN8388SR employ 4 ch. H-bridge system that they are suitable for driving motor or actuator of CD player. Also they employ the surface mounting type package superior in radiation characteristics.

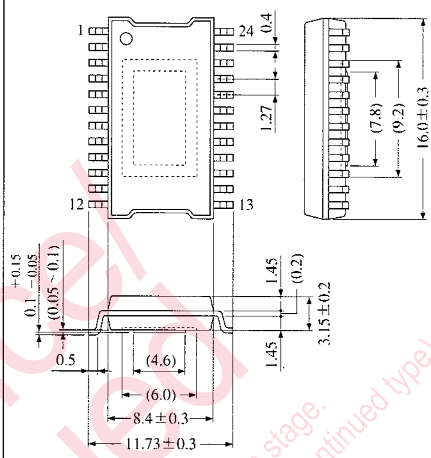
### ■ Features

- Wide output D-range is available regardless of reference supply on the system.
- 4 ch. BTL Driver built-in. Particularly suitable for driver of actuator or motor of about 8 Ω load.
- PC (Power Control) feature built-in
- Thermal shut down circuit (with hysteresis) built-in
- Control for proper heat of IC by separating the power supplies for signal line and output line.

### ■ Application

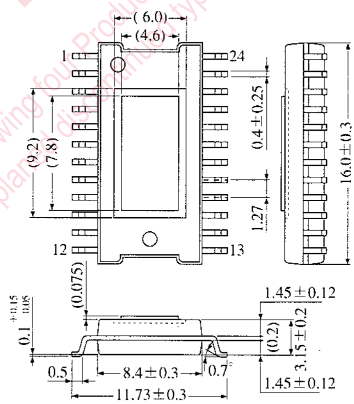
- CD player, CD-ROM
- For drive of motor

AN8388S Unit : mm



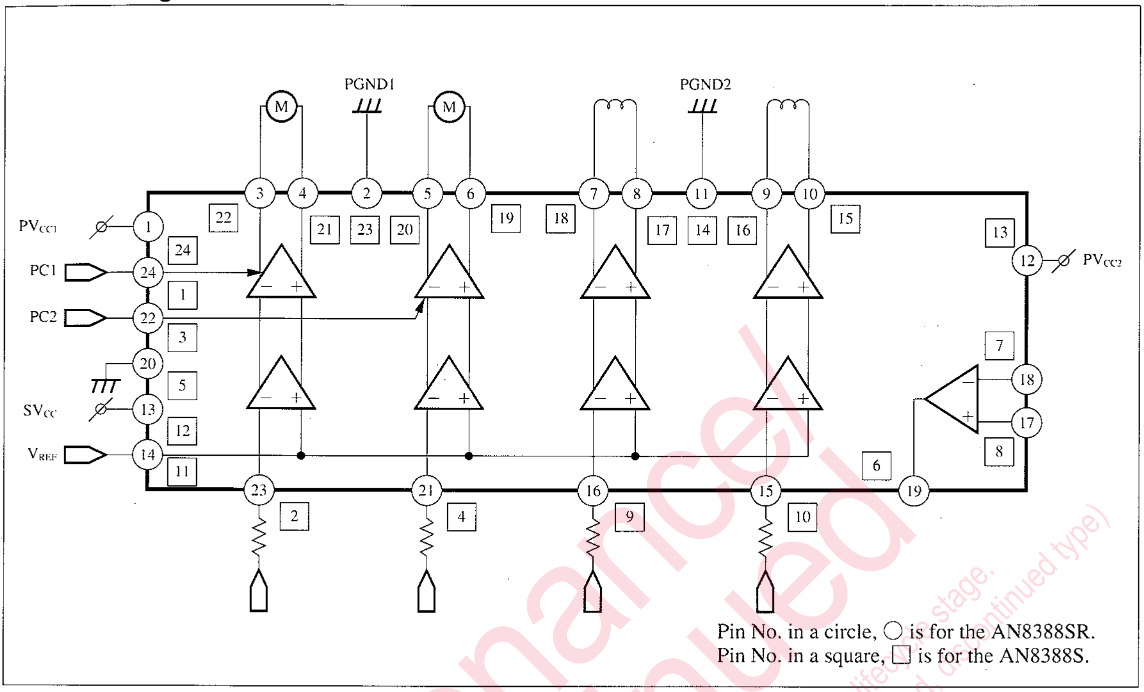

24-lead SOP fin package (HSOP024-P-0450)

AN8388SR Unit : mm




24-lead SOP fin package (HSOP024-P-0450)

## ■ Block Diagram




## ■ Absolute Maximum Ratings (Ta=25℃)

| Parameter | Symbol | Rating | Unit |
|---|---|---|---|
| Supply Voltage | $SV_{CC}$ | 16 | V |
| Supply Current | $I_{CC}$ | — | mA |
| Power Dissipation Note) | $P_D$ | 2083 | mW |
| Operating Ambient Temperature | $T_{opr}$ | −30 ~ +85 | ℃ |
| Storage Temperature | $T_{stg}$ | −55 ~ +150 | ℃ |

Note) For surface mounting on 50×50×1.2mm glass epoxy board

## ■ Recommended Operating Range (Ta=25℃)

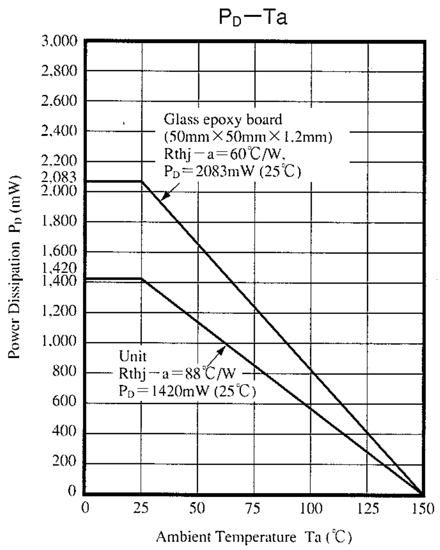
| Parameter | Symbol | Range |
|---|---|---|
| Operating Supply Voltage Range | $V_{CC}$ | 4.5V ~ 15V |
| | $PV_{CC}$ | |

## ■ Electrical Characteristics (Ta = 25℃ ± 2℃)

| Parameter | Symbol | Condition | min. | typ. | max. | Unit |
|---|---|---|---|---|---|---|
| Total Circuit Current | $I_{tot}$ | $PV_{CC1}=PV_{CC2}=SV_{CC}=8V$ | 10 | 25 | 40 | mA |
| **Reset Circuit** | | | | | | |
| Reset Operation Release Supply Voltage | $V_{RST}$ | $R_L=8\Omega$ | — | — | 4.5 | V |
| **Driver 1** | | | | | | |
| Input Offset Voltage | $V_{IOF1}$ | $PV_{CC1}=PV_{CC2}=SV_{CC}=8V$<br>$R_L=8\Omega$, $R_{IN}=10k\Omega$ | −10 | — | 10 | mV |
| Output Offset Voltage | $V_{OOF1}$ | $PV_{CC1}=PV_{CC2}=SV_{CC}=8V$<br>$R_L=8\Omega$, $R_{IN}=10k\Omega$ | −60 | — | 60 | mV |
| Gain (+) | $G_{1+}$ | $PV_{CC1}=PV_{CC2}=SV_{CC}=8V$<br>$R_L=8\Omega$, $R_{IN}=10k\Omega$ | 14 | 17 | 21 | dB |
| (+) (−) Relative Gain | $\Delta G_1$ | $PV_{CC1}=PV_{CC2}=SV_{CC}=8V$<br>$R_L=8\Omega$, $R_{IN}=10k\Omega$ | −1.7 | 0 | 1.7 | dB |
| Limit Voltage (+) | $V_{L1+}$ | $PV_{CC1}=PV_{CC2}=SV_{CC}=8V$<br>$R_L=8\Omega$, $R_{IN}=10k\Omega$ | 4.4 | 4.9 | 5.4 | V |
| Limit Voltage (−) Note 1) | $V_{L1-}$ | $PV_{CC1}=PV_{CC2}=SV_{CC}=8V$<br>$R_L=8\Omega$, $R_{IN}=10k\Omega$ | 0.93 | 1.0 | 1.07 | — |
| Dead Zone Width | $V_{DZ1}$ | $PV_{CC1}=PV_{CC2}=SV_{CC}=8V$<br>$R_L=8\Omega$, $R_{IN}=10k\Omega$ | −10 | — | 20 | mV |
| PC Operation Threshold H | $V_{PC1H}$ | $PV_{CC1}=PV_{CC2}=SV_{CC}=8V$<br>$R_L=8\Omega$, $R_{IN}=10k\Omega$ | 3 | — | — | V |
| **Drivers 2 to 4** | | | | | | |
| Input Offset Voltage | $V_{IOF}$ | $PV_{CC1}=PV_{CC2}=SV_{CC}=8V$<br>$R_L=8\Omega$, $R_{IN}=10k\Omega$ | −10 | — | 10 | mV |
| Output Offset Voltage | $V_{OOF}$ | $PV_{CC1}=PV_{CC2}=SV_{CC}=8V$<br>$R_L=8\Omega$, $R_{IN}=10k\Omega$ | −60 | — | 60 | mV |
| Gain (+) | $G_+$ | $PV_{CC1}=PV_{CC2}=SV_{CC}=8V$<br>$R_L=8\Omega$, $R_{IN}=10k\Omega$ | 14 | 17 | 21 | dB |
| (+) (−) Relative Gain | $\Delta G$ | $PV_{CC1}=PV_{CC2}=SV_{CC}=8V$<br>$R_L=8\Omega$, $R_{IN}=10k\Omega$ | 0.93 | 1.0 | 1.07 | — |
| Limit Voltage (+) Note 2) | $V_{L+}$ | $PV_{CC1}=PV_{CC2}=SV_{CC}=8V$<br>$R_L=8\Omega$, $R_{IN}=10k\Omega$ | 0.93 | 1.0 | 1.07 | — |
| Limit Voltage (−) Note 1) | $V_{L-}$ | $PV_{CC1}=PV_{CC2}=SV_{CC}=8V$<br>$R_L=8\Omega$, $R_{IN}=10k\Omega$ | 0.93 | 1.0 | 1.07 | — |
| Dead Zone Width | $V_{DZ}$ | $PV_{CC1}=PV_{CC2}=SV_{CC}=8V$<br>$R_L=8\Omega$, $R_{IN}=10k\Omega$ | −10 | — | 20 | mV |
| PC Operation Threshold H | $V_{PCH}$ | $PV_{CC1}=PV_{CC2}=SV_{CC}=8V$<br>$R_L=8\Omega$, $R_{IN}=10k\Omega$ | 3 | — | — | V |
| Operational amplifier Offset Voltage | $V_{OF-OP}$ | $PV_{CC1}=PV_{CC2}=SV_{CC}=8V$ | −40 | — | 40 | mV |
| **Heat Protection Circuit** | | | | | | |
| Operation Temperature Equilibrium Value Note 3) | $T_{THD}$ | | ( — ) | (160) | ( — ) | ℃ |
| Operation Temperature Hysteresis Width Note 3) | $\Delta T_{THD}$ | | ( — ) | ( 65) | ( — ) | ℃ |

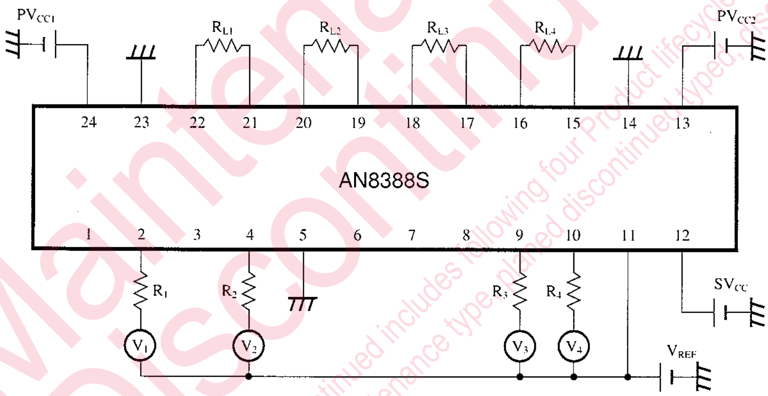
Note1) Relative voltage ratio of limit voltage (−) to limit voltage (+) for each channel.
Note2) Relative voltage ratio of limit voltage (+) of Drivers 2 to 4 to limit voltage (+) of Driver 1
Note3) Characteristic value in parentheses is a reference value for design but not a guaranteed value.

## ■ Characteristic Curve




## ■ Cautions for use

• **AN8388S**




When the AN8388S is used, take into account the following cautions and follow the power dissipation characteristic curve.

(1) Load current, $I_{P1}$ flowing in loads $R_{L1}$ and $R_{L2}$ is supplied through Pin㉔.

$$I_{P1} = \frac{|V_{22-21}|}{R_{L1}} + \frac{|V_{20-19}|}{R_{L2}}$$

(2) Load current, $I_{P2}$ flowing in loads $R_{L3}$ and $R_{L4}$ is supplied through Pin⑬.

$$I_{P2} = \frac{|V_{18-17}|}{R_{L3}} + \frac{|V_{16-15}|}{R_{L4}}$$

(3) Dissipation increase ($\Delta P_d$) inside the IC (power output stage) caused by loads $R_{L1}$, $R_{L2}$, $R_{L3}$, and $R_{L4}$ is as follows:

$$\Delta P_d = (PV_{CC1} - |V_{22-21}|) \times \frac{|V_{22-21}|}{R_{L1}} + (PV_{CC1} - |V_{20-19}|) \times \frac{|V_{20-19}|}{R_{L2}}$$
$$+ (PV_{CC2} - |V_{18-17}|) \times \frac{|V_{18-17}|}{R_{L3}} + (PV_{CC2} - |V_{16-15}|) \times \frac{|V_{16-15}|}{R_{L4}}$$

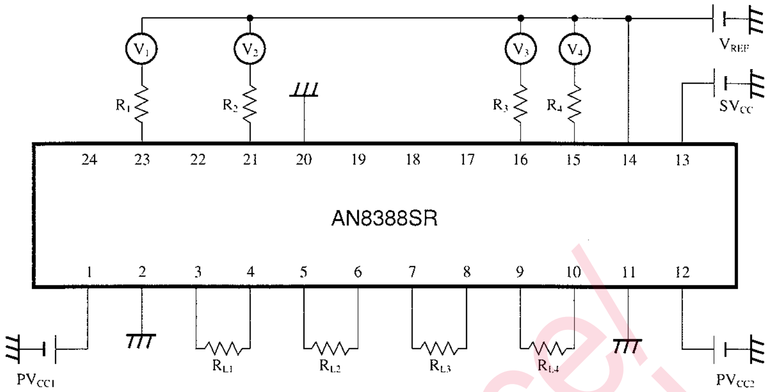
(4) Dissipation increase ($\Delta P_S$) inside the IC (signal block supplied from Pin⑫) caused by loads $R_{L1}$, $R_{L2}$, $R_{L3}$, and $R_{L4}$ is almost as follows:

$$\Delta P_S = V_{CC} \times \left( \frac{|V_1|}{R_1} + \frac{|V_2|}{R_2} + \frac{|V_3|}{R_3} + \frac{|V_4|}{R_4} \right) \times 10 + \frac{V_{CC}}{100} \times \left( \frac{|V_{22-21}|}{R_{L1}} + \frac{|V_{20-19}|}{R_{L2}} + \frac{|V_{18-17}|}{R_{L3}} + \frac{|V_{16-15}|}{R_{L4}} \right)$$

(5) Dissipation increase inside the IC during driver running is $\Delta P_d + \Delta P_S$.

## ■ Cautions for use

### • AN8388SR




When the AN8388SR is used, take into account the following cautions and follow the power dissipation characteristic curve.

(1) Load current, $I_{P1}$ flowing in loads $R_{L1}$ and $R_{L2}$ is supplied through Pin①.

$$I_{P1} = \frac{|V_{3-4}|}{R_{L1}} + \frac{|V_{5-6}|}{R_{L2}}$$

(2) Load current, $I_{P2}$ flowing in loads $R_{L3}$ and $R_{L4}$ is supplied through Pin⑫.

$$I_{P2} = \frac{|V_{7-8}|}{R_{L3}} + \frac{|V_{9-10}|}{R_{L4}}$$

(3) Dissipation increase ($\Delta P_d$) inside the IC (power output stage) caused by loads $R_{L1}$, $R_{L2}$, $R_{L3}$ and $R_{L4}$ is as follows:

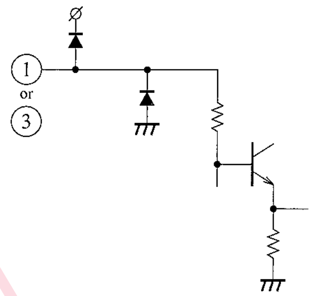
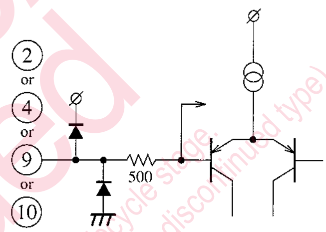
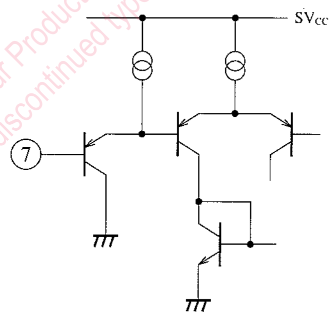
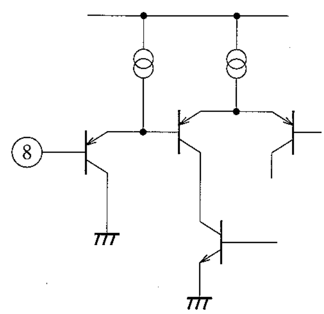
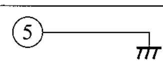
$$\Delta P_d = (PV_{CC1} - |V_{3-4}|) \times \frac{|V_{3-4}|}{R_{L1}} + (PV_{CC1} - |V_{5-6}|) \times \frac{|V_{5-6}|}{R_{L2}}$$
$$+ (PV_{CC2} - |V_{7-8}|) \times \frac{|V_{7-8}|}{R_{L3}} + (PV_{CC2} - |V_{9-10}|) \times \frac{|V_{9-10}|}{R_{L4}}$$

(4) Dissipation increase ($\Delta P_S$) inside the IC (signal block supplied from Pin⑬) caused by loads $R_{L1}$, $R_{L2}$, $R_{L3}$ and $R_{L4}$ is almost as follows:

$$\Delta P_S = V_{CC} \times \left( \frac{|V_1|}{R_1} + \frac{|V_2|}{R_2} + \frac{|V_3|}{R_3} + \frac{|V_4|}{R_4} \right) \times 10 + \frac{V_{CC}}{100} \times \left( \frac{|V_{3-4}|}{R_{L1}} + \frac{|V_{5-6}|}{R_{L2}} + \frac{|V_{7-8}|}{R_{L3}} + \frac{|V_{9-10}|}{R_{L4}} \right)$$

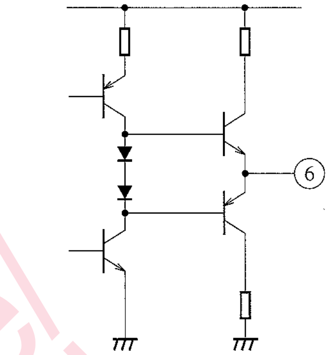
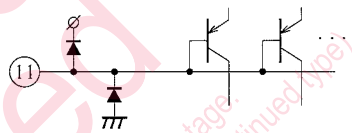
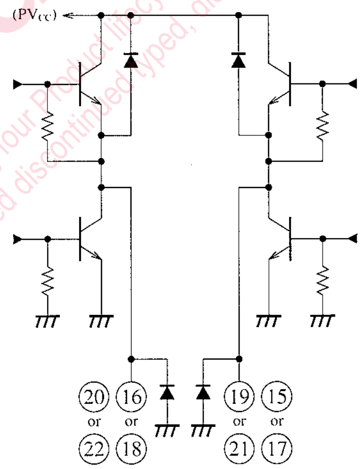
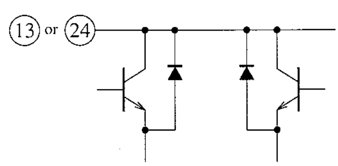
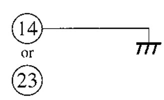
(5) Dissipation increase inside the IC during driver running is, $\Delta P_d + \Delta P_S$.

## ■ Pin Description

| Pin No. AN8388S | Pin No. AN8388SR | Symbol | I/O | DC voltage ($V_{CC}$/8V) | Pin Description | Equivalent Circuit |
|---|---|---|---|---|---|---|
| 1 | 24 | PC1 | I | 0V | PC (power cut) input pin controlling the output of ㉑ and ㉒ |  |
| 3 | 22 | PC2 | I | 0V | PC (power cut) input pin controlling the output of ⑲ and ⑳ | |
| 2 | 23 | IN1 | I | 2.5V | Error input pin of Driver 1 |  |
| 4 | 21 | IN2 | I | 2.5V | Error input pin of Driver 2 | |
| 9 | 16 | IN3 | I | 2.5V | Error input pin of Driver 3 | |
| 10 | 15 | IN4 | I | 2.5V | Error input pin of Driver 4 | |
| 7 | 18 | IN− | I | — V | Reverse rotation input pin of operational amplifier |  |
| 8 | 17 | IN+ | I | — V | Normal rotation input pin of operational amplifier |  |
| 12 | 13 | $SV_{CC}$ | I | 8V | $SV_{CC}$ pin for control circuit of driver, not connected to power $V_{CC}$ pin. |  |
| 5 | 20 | SGND | I | 0V | SGND pin for control circuit of driver |  |

Note) The pin numbers shown in the equivalent circuit diagram are only for the AN8388S. For the AN8388SR, they must be replaced.

## ■ Pin Description (Cont.)

| Pin No. AN8388S | Pin No. AN8388SR | Symbol | I/O | DC voltage ($V_{CC}$/8V) | Pin Description | Equivalent Circuit |
|---|---|---|---|---|---|---|
| 6 | 19 | OPO | O | — V | Operational amplifier output pin |  |
| 11 | 14 | $V_{REF}$ | I | 2.5V | $V_{REF}$ input pin |  |
| 22 | 3 | D1− | O | 0V | Reverse rotation output pin of Driver 1 |  |
| 21 | 4 | D1+ | O | 0V | Normal rotation output pin of Driver 1 | |
| 20 | 5 | D2− | O | 0V | Reverse rotation output pin of Driver 2 | |
| 19 | 6 | D2+ | O | 0V | Normal rotation output pin of Driver 2 | |
| 18 | 7 | D3− | O | 0V | Reverse rotation output pin of Driver 3 | |
| 17 | 8 | D3+ | O | 0V | Normal rotation output pin of Driver 3 | |
| 16 | 9 | D4− | O | 0V | Reverse rotation output pin of Driver 4 | |
| 15 | 10 | D4+ | O | 0V | Normal rotation output pin of Driver 4 | |
| 24 | 1 | $PV_{CC1}$ | I | 8V | Power $V_{CC}$ pin, supplying the current flowing for output power transistors of (19), (20), (21), and (22) |  |
| 13 | 12 | $PV_{CC2}$ | I | 8V | Power $V_{CC}$ pin, supplying the current flowing for output power transistors of (15), (16), (17), and (18) | |
| 23 | 2 | PGND1 | I | 0V | PGND pin for output transistors of (19), (20), (21), and (22) |  |
| 14 | 11 | PGND2 | I | 0V | PGND pin for output transistors of (15), (16), (17), and (18) | |

Note) The pin numbers shown in the equivalent circuit diagram are only for the AN8388S. For the AN8388SR, they must be replaced.

ICs for CD/ CD-ROM

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