

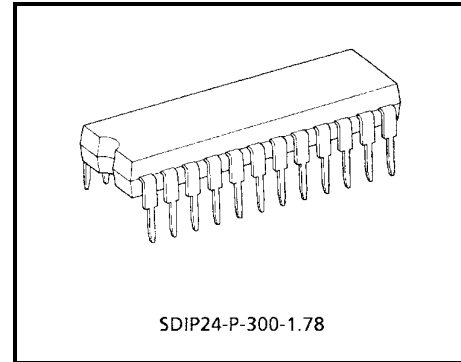
# TA2092N

## Power Driver IC for CD Player

The TA2092N is a power driver IC developed for CD players. This IC have built-in 4 channel BTL power amplifiers which drives focus-coil, tracking-coil for 3-beam pick-up head, disc motor and feed motor.

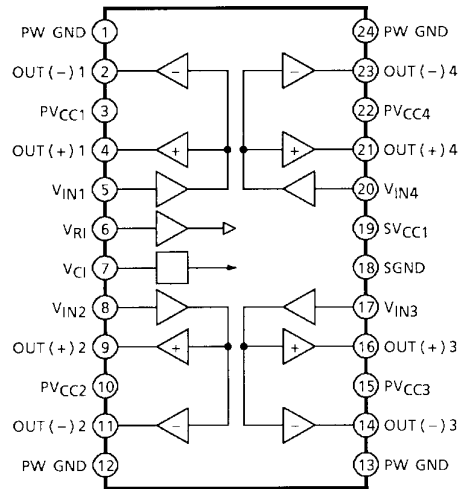
### Features

- 4 channel BTL linear drivers
- Fixed voltage gain:  $G_V = 15\text{dB}$  (typ.)
- High output power  
 :  $V_{OM1} = 5\text{ V}_{p-p}$  (typ.) @  $V_{CC} = 5\text{ V}$ ,  $R_L = 5\ \Omega$   
 :  $V_{OM2} = 6\text{ V}_{p-p}$  (typ.) @  $V_{CC} = 6\text{ V}$ ,  $R_L = 5\ \Omega$
- Thermal shutdown circuit
- Input reference voltage short protection
- Operating voltage range:  $V_{CC}(\text{opr}) = 4.0\sim 10.0\text{ V}$  ( $T_a = 25^\circ\text{C}$ )



Weight: 1.2 g (typ.)

### Block Diagram



## Terminal Explanation

| Terminal No. | Symbol            | Function   | Equivalent Circuit |   |
|--------------|-------------------|--|--------------------|---|
| 1            | PW GND            | Power GND<br><ul style="list-style-type: none"> <li>Connected to substrate.</li> <li>pin 1, 12, 13, 24 are connected inside.</li> </ul>  |                    |   |
| 2            | OUT (-) 1         | Inverted output for CH1  |                    |   |
| 3            | PVCC1             | Supply terminal of output stage for CH1<br><ul style="list-style-type: none"> <li>Supply terminal of output stage are not connected to other channel terminal.</li> </ul>  |                    |   |
| 4            | OUT (+) 1         | Non-inverted output for CH1  |                    |   |
| 5            | V <sub>IN1</sub>  | Input for CH1<br><ul style="list-style-type: none"> <li>Not biased inside</li> </ul>   |                    |   |
| 6            | V <sub>RI</sub>   | Input reference voltage<br><ul style="list-style-type: none"> <li>Under condition of V<sub>RI</sub> ≤ 1.8 V, internal bias circuit is shut off.</li> <li>No signal input condition: V<sub>RI</sub> = V<sub>IN</sub></li> </ul> |                    |   |
| 7            | V <sub>CI</sub>   | Output reference voltage<br><ul style="list-style-type: none"> <li>V<sub>OUT</sub> = V<sub>CI</sub> = (V<sub>CC</sub> - V<sub>F</sub>) / 2</li> </ul>  |                    |   |
| 8            | V <sub>IN2</sub>  | Input for CH2  | Same as channel 1  |   |
| 9            | OUT (+) 2         | Non-inverted output for CH2  |                    |   |
| 10           | PVCC2             | Supply terminal of output stage for CH2  |                    |   |
| 11           | OUT (-) 2         | Inverted output for CH2  |                    |   |
| 12           | PW GND            | Power GND  | Same as channel 1  |   |
| 13           | PW GND            | Power GND  |                    |   |
| 14           | OUT (-) 3         | Inverted output for CH3  |                    |   |
| 15           | PVCC3             | Supply terminal of output stage for CH3  |                    |   |
| 16           | OUT (+) 3         | Non-inverted output for CH3  | Same as channel 1  |   |
| 17           | V <sub>IN3</sub>  | Input for CH3  |                    |   |
| 18           | S GND             | Supply terminal of small signal GND  |                    | — |
| 19           | S V <sub>CC</sub> | Small signal GND   |                    | — |
| 20           | V <sub>IN4</sub>  | Input for CH4  | Same as channel 1  |   |
| 21           | OUT (+) 4         | Non-inverted output for CH4  |                    |   |
| 22           | PVCC4             | Supply terminal of output stage for CH4  |                    |   |
| 23           | OUT (-) 4         | Inverted output for CH4  |                    |   |
| 24           | PW GND            | Power GND  |                    |   |

## Maximum Ratings (Ta = 25°C)

| Characteristics       | Symbol                  | Rating       | Unit |
|-----------------------|-------------------------|--------------|------|
| Supply voltage        | V <sub>CC</sub>         | 14           | V    |
| Power dissipation     | P <sub>D</sub> (Note 1) | (2) (Note 2) | W    |
| Operating temperature | T <sub>opr</sub>        | -30~85       | °C   |
| Storage temperature   | T <sub>stg</sub>        | -55~150      | °C   |

Note 1: Mounted on 50 mm × 50 mm × 1.6 mm size board with copper area 60 % over.

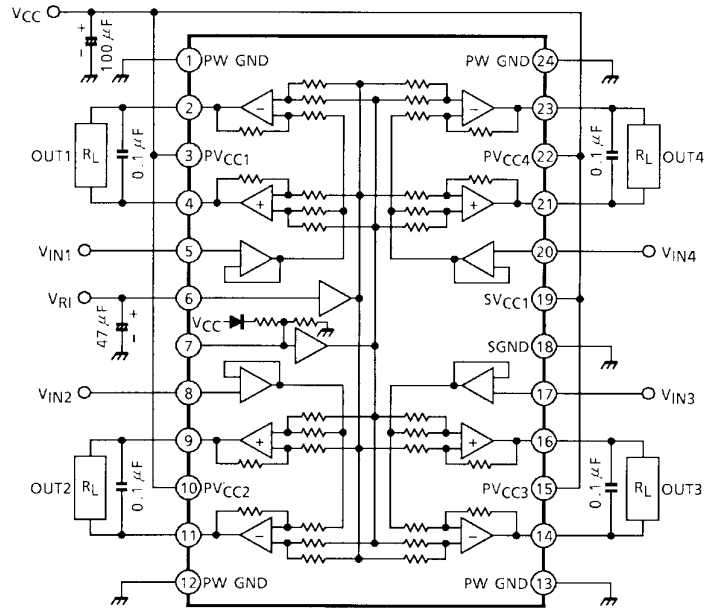
Note 2: Derated above Ta = 25°C, in the proportion of 62.5 mW/°C.

## Electrical Characteristics

(unless otherwise specified, V<sub>CC</sub> = 5 V, R<sub>L</sub> = 5 Ω, R<sub>g</sub> = 620 Ω, V<sub>RI</sub> = 2.1 V, f = 1 kHz, Ta = 25°C)

| Characteristics                               | Symbol              | Test Circuit | Test Condition  | Min  | Typ. | Max  | Unit             |
|---|---------------------|--------------|---|------|------|------|------------------|
| Operating voltage                             | V <sub>CC</sub>     | —            | —   | 4.0  | —    | 10.0 | V                |
| Quiescent current                             | I <sub>CCQ</sub>    | —            | V <sub>in</sub> = 0, R <sub>L</sub> = OPEN              | 20   | 35   | 60   | mA               |
| Input offset current                          | I <sub>IN</sub>     | —            | V <sub>IN</sub> = 2.1 V                                 | —    | 250  | 800  | nA               |
| V <sub>RI</sub> terminal offset current       | I <sub>I0</sub>     | —            | V <sub>RI</sub> = 2.1 V                                 | —    | 35   | 120  | μA               |
| Output offset voltage                         | V <sub>O OS1</sub>  | —            | V <sub>CC</sub> = 5 V, R <sub>g</sub> = 0 Ω             | -30  | —    | 30   | mV               |
|   | V <sub>O OS2</sub>  | —            | V <sub>CC</sub> = 8 V, R <sub>g</sub> = 0 Ω             | -50  | —    | 50   |                  |
|   | V <sub>O OS3</sub>  | —            | V <sub>CC</sub> = 12 V, R <sub>g</sub> = 0 Ω            | -100 | —    | 100  |                  |
| Reference output voltage                      | V <sub>OUT</sub>    | —            | —   | —    | 2.1  | —    | V                |
| Maximum output voltage                        | V <sub>OM1</sub>    | —            | V <sub>CC</sub> = 5 V                                   | 4.0  | 5.0  | —    | V <sub>p-p</sub> |
|   | V <sub>OM2</sub>    | —            | V <sub>CC</sub> = 6 V                                   | 5.0  | 6.0  | —    |                  |
| Voltage gain                                  | G <sub>V</sub>      | —            | V <sub>in</sub> = 100 mVrms                             | 14.5 | 15.5 | 16.5 | dB               |
| Frequency response                            | f <sub>c</sub>      | —            | V <sub>in</sub> = 100 mVrms                             | —    | 100  | —    | kHz              |
| Total harmonic distortion                     | THD                 | —            | V <sub>in</sub> = 100 mVrms                             | —    | -50  | —    | dB               |
| Slew rate                                     | S.R.                | —            | V <sub>out</sub> = 2 V <sub>p-p</sub>                   | —    | 1.0  | —    | V/μs             |
| Cross talk                                    | C.T.                | —            | V <sub>out</sub> = 1 Vrms                               | —    | -60  | —    | dB               |
| Ripple rejection ratio                        | R.R.                | —            | f <sub>rip</sub> = 100 Hz, V <sub>rip</sub> = 100 mVrms | —    | -60  | —    | dB               |
| Thermal shut down temperature                 | T <sub>TSD</sub>    | —            | Chip temperature  | —    | 150  | —    | °C               |
| V <sub>RI</sub> ~GND short protection voltage | V <sub>RI OFF</sub> | —            | —   | 1.4  | 1.6  | 1.8  | V                |

## Test Circuit



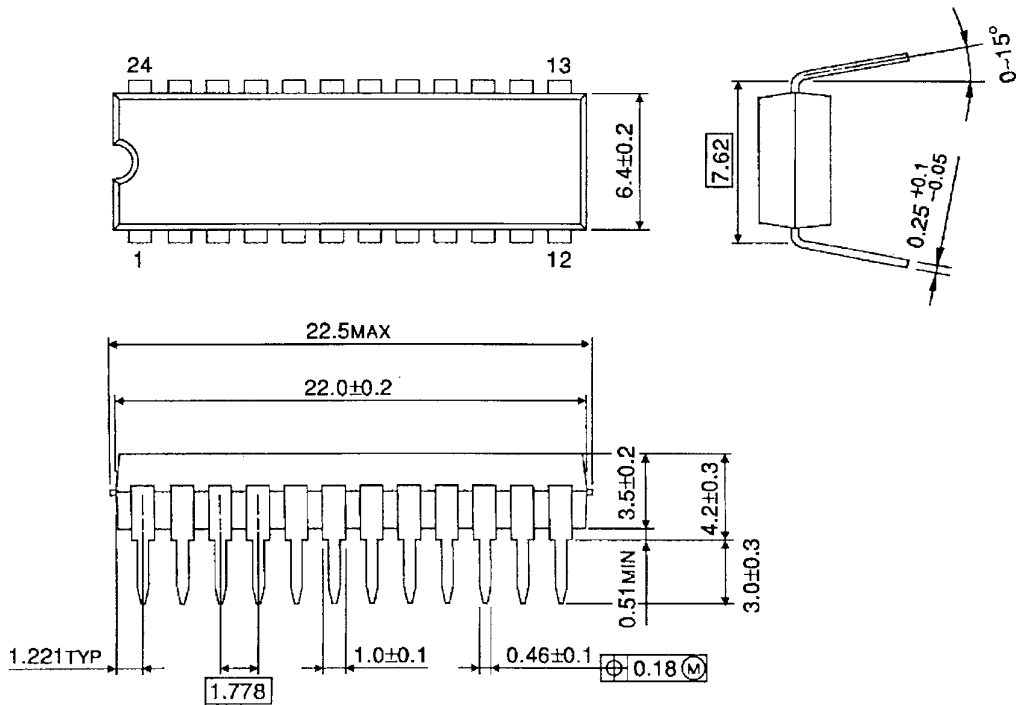
## Precaution Use

- Input stage
  - Input stages are consisted of differential circuit of NPN Tr, and have built-in IB compensation circuit.
- Built-in driver
  - Each channel driver consists of BTL configuration linear amplifier.  
Voltage gain is fixed:  $G_V = 15.5\text{dB}$  (typ.)  
Voltage loss for output stage is  $2 V_{BE} = V_{CE}(\text{sat})$  for positive cycle,  $V_{CE}(\text{sat})$  for negative cycle, because of no-bootstrap circuit. So, output DC voltage is designed as less than  $1/2 V_{CC}$ .
- VRI terminal
  - VRI is reference voltage terminal for input signal.  
If reference voltage from servo IC drop less than 1.8 V, protection circuit operates and shut off bias circuit inside. This operation is to prevent load from moving undesireably in case of VRI drop for accident or some reason.
- VCI terminal
  - Output DC voltage is determined by circuit of this terminal inside as:  
 $V_{CI} = V_{OUT}(\text{DC}) = (V_{CC} - V_F) / 2$
  - Output signal dynamic range is depend on  $V_{CC}$ . On the other hand, input signal dynamic range is determined by VRI as mentioned and voltage gain is fixed inside. So, maximum output voltage does not increase as  $V_{CC}$  increases.
  - Because of BTL configuration, Ripple Rejection Ratio does not improve not much when capacitor is connected to VCI terminal to GND.
- GND
  - Large signal GND is for output stage and small signal GND is for stages from input circuit to pre-output stage.
  - These GND pins are not connected inside.
  - The heat of power dissipation is transferred to PCB, through these PW-GND Pin, because, 1, 12, 13, 24 pin are connected each other and to substrate of Pellet to connected copper foil area as large as possible.
- Oscillation preventive capacitor
  - We recommend to use the capacitor of 0.1  $\mu\text{F}$ , between each output terminals. But perform the temperature test to check the oscillation allowance, since the oscillation allowance is varied according to the causes described below.
    - 1) Supply voltage
    - 2) Ambient temperature
    - 3) Load impedance
    - 4) Capacity value of condenser
    - 5) Kind of condenser
    - 6) Layout of Printed board
  - We recommend to connect Pass-condenser, which is about 10 to 100  $\mu\text{F}$  between VRI terminal and GND.
  - VCI terminal is recommend to use "OPEN".

## Package Dimensions

SDIP24-P-300-1.78

Unit : mm



Weight: 1.2 g (typ.)

**RESTRICTIONS ON PRODUCT USE**

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