DATA SHEET

TDA7053
2 x 1 W portable/mains-fed stereo power amplifier

Product specification
File under Integrated Circuits, IC01

February 1994
**2 x 1 W portable/mains-fed stereo power amplifier**  
TDA7053

**GENERAL DESCRIPTION**
The TDA7053 is an integrated class-B stereo power amplifier in a 16-lead dual-in-line (DIL) plastic package. The device, consisting of two BTL amplifiers, is primarily developed for portable audio applications but may also be used in mains-fed applications.

**Features**
- No external components
- No switch-ON/OFF clicks
- Good overall stability
- Low power consumption
- Short-circuit-proof.

**QUICK REFERENCE DATA**

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>CONDITIONS</th>
<th>SYMBOL</th>
<th>MIN.</th>
<th>TYP.</th>
<th>MAX.</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage range</td>
<td></td>
<td>$V_P$</td>
<td>3</td>
<td>6</td>
<td>18</td>
<td>V</td>
</tr>
<tr>
<td>Total quiescent current</td>
<td>$R_L = \infty$</td>
<td>$I_{tot}$</td>
<td>–</td>
<td>9</td>
<td>16</td>
<td>mA</td>
</tr>
<tr>
<td>Output power</td>
<td>$R_L = 8 \Omega$; $V_P = 6 \text{ V}$</td>
<td>$P_O$</td>
<td>–</td>
<td>1.2</td>
<td>–</td>
<td>W</td>
</tr>
<tr>
<td>Internal voltage gain</td>
<td>$P_O = 0.1 \text{ W}$</td>
<td>$G_v$</td>
<td>38</td>
<td>39</td>
<td>40</td>
<td>dB</td>
</tr>
<tr>
<td>Total harmonic distortion</td>
<td></td>
<td>THD</td>
<td>–</td>
<td>0.2</td>
<td>1.0</td>
<td>%</td>
</tr>
</tbody>
</table>

**PACKAGE OUTLINE**
16-lead DIL; plastic (SOT38); SOT38-1; 1996 July 24.
2 x 1 W portable/mains-fed stereo
power amplifier

Fig. 1  Block diagram.
Philips Semiconductors Product specification

2 x 1 W portable/mains-fed stereo power amplifier

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PINNING

1. SGND1 signal ground 1
2. IN1 input 1
3. n.c. not connected
4. n.c. not connected
5. VP supply voltage
6. IN2 input 2
7. SGND2 signal ground 2
8. n.c. not connected
9. OUT2A output 2 (positive)
10. GND2 power ground 2
11. n.c. not connected
12. OUT2B output 2 (negative)
13. OUT1B output 1 (negative)
14. GND1 power ground 1
15. n.c. not connected
16. OUT1A output 1 (positive)

Note
The information contained within the parentheses refer to the polarity of the loudspeaker terminal to which the output must be connected.

FUNCTIONAL DESCRIPTION

The TDA7053 is a stereo output amplifier, with an internal gain of 39 dB, which is primarily for use in portable audio applications but may also be used in mains-fed applications. The current trends in portable audio application design is to reduce the number of batteries which results in a reduction of output power when using conventional output stages. The TDA7053 overcomes this problem by using the Bridge-Tied-Load (BTL) principle and is capable of delivering 1.2 W into an 8 Ω load (VP = 6 V). The load can be short-circuited under all input conditions.
RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>CONDITIONS</th>
<th>SYMBOL</th>
<th>MIN.</th>
<th>MAX.</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage</td>
<td>V_P</td>
<td>–</td>
<td>18</td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>Non-repetitive peak output current</td>
<td>I_OSM</td>
<td>–</td>
<td>1.5</td>
<td></td>
<td>A</td>
</tr>
<tr>
<td>Total power dissipation</td>
<td>P_tot</td>
<td>see Fig.2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crystal temperature</td>
<td>T_c</td>
<td>–</td>
<td>+150</td>
<td></td>
<td>°C</td>
</tr>
<tr>
<td>Storage temperature range</td>
<td>T_stg</td>
<td>–55</td>
<td>+150</td>
<td></td>
<td>°C</td>
</tr>
</tbody>
</table>

THERMAL RESISTANCE

From junction to ambient

\( R_{th\:j-a} \) = 50 K/W

Power dissipation

Assuming: \( V_P = 6 \text{ V} \) and \( R_L = 8 \text{ Ω} \):

The maximum sinewave dissipation is 1.8 W, therefore

\[ T_{amb\:(max)} = 150 - (50 \times 1.8) = 60 \text{ °C}. \]
CHARACTERISTICS

$V_P = 6 \text{ V}$; $R_L = 8 \Omega$; $T_{\text{amb}} = 25 ^\circ \text{C}$; unless otherwise specified; measured from test circuit, Fig.7.

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>CONDITIONS</th>
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<th>MIN.</th>
<th>TYP.</th>
<th>MAX.</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage range</td>
<td>$R_L = \infty$; note 1</td>
<td>$V_P$</td>
<td>3</td>
<td>6</td>
<td>18</td>
<td>V</td>
</tr>
<tr>
<td>Total quiescent current</td>
<td></td>
<td>$I_{\text{tot}}$</td>
<td>–</td>
<td>9</td>
<td>16</td>
<td>mA</td>
</tr>
<tr>
<td>Input bias current</td>
<td></td>
<td>$I_{\text{bias}}$</td>
<td>–</td>
<td>100</td>
<td>300</td>
<td>nA</td>
</tr>
<tr>
<td>Supply voltage ripple rejection</td>
<td>note 2</td>
<td>SVRR</td>
<td>40</td>
<td>50</td>
<td>–</td>
<td>dB</td>
</tr>
<tr>
<td>Input impedance</td>
<td></td>
<td>$Z_I$</td>
<td>–</td>
<td>100</td>
<td>–</td>
<td>kΩ</td>
</tr>
<tr>
<td>DC output offset voltage</td>
<td>note 3</td>
<td>$\Delta V_{13-16}$</td>
<td>–</td>
<td>–</td>
<td>100</td>
<td>mV</td>
</tr>
<tr>
<td>Noise output voltage</td>
<td>note 4</td>
<td>$V_{\text{no(rms)}}$</td>
<td>–</td>
<td>150</td>
<td>300</td>
<td>µV</td>
</tr>
<tr>
<td></td>
<td>note 5</td>
<td>$V_{\text{no(rms)}}$</td>
<td>–</td>
<td>60</td>
<td>–</td>
<td>µV</td>
</tr>
<tr>
<td>Output power</td>
<td>$\text{THD} = 10%$</td>
<td>$P_O$</td>
<td>–</td>
<td>1.2</td>
<td>–</td>
<td>W</td>
</tr>
<tr>
<td>Total harmonic distortion</td>
<td>$P_O = 0.1 \text{ W}$</td>
<td>THD</td>
<td>–</td>
<td>0.2</td>
<td>1.0</td>
<td>%</td>
</tr>
<tr>
<td>Internal voltage gain</td>
<td></td>
<td>$G_v$</td>
<td>38</td>
<td>39</td>
<td>40</td>
<td>dB</td>
</tr>
<tr>
<td>Channel balance</td>
<td></td>
<td>$\Delta G_v$</td>
<td>–</td>
<td>–</td>
<td>1</td>
<td>dB</td>
</tr>
<tr>
<td>Channel separation</td>
<td>note 3</td>
<td>$\alpha$</td>
<td>40</td>
<td>–</td>
<td>–</td>
<td>dB</td>
</tr>
<tr>
<td>Frequency response</td>
<td></td>
<td>$f$</td>
<td>–</td>
<td>0.02 to 20</td>
<td>–</td>
<td>kHz</td>
</tr>
</tbody>
</table>

Notes to the characteristics

1. With a practical load the total quiescent current depends on the offset voltage.
2. Ripple rejection measured at the output with $R_S = 0 \Omega$ and $f = 100 \text{ Hz}$ to 10 kHz. The ripple voltage (200 mV) is applied to the positive supply rail.
3. $R_S = 5 \text{ kΩ}$.
4. The noise output voltage (RMS value) is measured with $R_S = 5 \text{ kΩ}$, unweighted and a bandwidth of 60 Hz to 15 kHz.
5. The noise output voltage (RMS value) is measured with $R_S = 0 \Omega$ and $f = 500 \text{ kHz}$ with 5 kHz bandwidth. If $R_L = 8 \Omega$ and $L_L = 200 \mu\text{H}$ the noise output current is only 100 nA.
APPLICATION INFORMATION

Fig.3 Quiescent current as a function of voltage supply \( (V_P) \); \( T_{amb} = 60 \, ^\circ C \).

Fig.4 Output power as a function of voltage supply \( (V_P) \); THD = 10\%; \( f = 1 \, kHz \); \( T_{amb} = 60 \, ^\circ C \).
**Philips Semiconductors**

**Product specification**

**2 x 1 W portable/mains-fed stereo power amplifier**

**TDA7053**

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**Fig. 5** Power dissipation as a function of output power; \( f = 1 \text{ kHz}; T_{\text{amb}} = 60 \degree \text{C} \).

Graph showing power dissipation \( P_d \) vs. output power \( P_o \) with three curves:

1. \( V_p = 6.0 \text{ V}; R_L = 8 \Omega \)
2. \( V_p = 7.5 \text{ V}; R_L = 16 \Omega \)
3. \( V_p = 9.0 \text{ V}; R_L = 25 \Omega \)

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**Fig. 6** Total harmonic distortion as a function of output power; \( f = 1 \text{ kHz}; T_{\text{amb}} = 60 \degree \text{C} \).

Graph showing total harmonic distortion (THD) % vs. output power \( P_o \) with three curves:

1. \( V_p = 6.0 \text{ V}; R_L = 8 \Omega \)
2. \( V_p = 7.5 \text{ V}; R_L = 16 \Omega \)
3. \( V_p = 9.0 \text{ V}; R_L = 25 \Omega \)
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Fig. 7 Test and application circuit diagram.
Philips Semiconductors

Product specification

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Fig. 8 Printed-circuit board, track side.

Fig. 9 Printed-circuit board, component side.
2 x 1 W portable/mains-fed stereo power amplifier  

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PACKAGE OUTLINE

DIP16: plastic dual in-line package; 16 leads (300 mil); long body  

SOT38-1

DIMENSIONS (inch dimensions are derived from the original mm dimensions)

<table>
<thead>
<tr>
<th>UNIT</th>
<th>A max.</th>
<th>A1 min.</th>
<th>A2 max.</th>
<th>b</th>
<th>b1</th>
<th>c</th>
<th>D(1)</th>
<th>E(1)</th>
<th>e</th>
<th>e1</th>
<th>L</th>
<th>Mε</th>
<th>MΗ</th>
<th>w</th>
<th>Z(1) max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>mm</td>
<td>4.7</td>
<td>0.51</td>
<td>3.7</td>
<td>1.40</td>
<td>0.53</td>
<td>0.32</td>
<td>21.8</td>
<td>6.48</td>
<td>2.54</td>
<td>3.9</td>
<td>8.25</td>
<td>9.5</td>
<td>0.254</td>
<td>2.2</td>
<td></td>
</tr>
<tr>
<td>inches</td>
<td>0.19</td>
<td>0.020</td>
<td>0.15</td>
<td>0.055</td>
<td>0.045</td>
<td>0.021</td>
<td>0.015</td>
<td>0.039</td>
<td>0.084</td>
<td>0.026</td>
<td>0.10</td>
<td>0.15</td>
<td>0.37</td>
<td>0.01</td>
<td>0.087</td>
</tr>
</tbody>
</table>

Note
1. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

OUTLINE VERSION | REFERENCES | EUROPEAN PROJECTION | ISSUE DATE
--- | --- | --- | ---
SOT38-1 | IEC 050G09 | MO-001AE | 92-10-02  95-01-19
SOLDERING

Introduction

There is no soldering method that is ideal for all IC packages. Wave soldering is often preferred when through-hole and surface mounted components are mixed on one printed-circuit board. However, wave soldering is not always suitable for surface mounted ICs, or for printed-circuits with high population densities. In these situations reflow soldering is often used.

This text gives a very brief insight to a complex technology. A more in-depth account of soldering ICs can be found in our “IC Package Databook” (order code 9398 652 90011).

Soldering by dipping or by wave

The maximum permissible temperature of the solder is 260 °C; solder at this temperature must not be in contact with the joint for more than 5 seconds. The total contact time of successive solder waves must not exceed 5 seconds.

Repairing soldered joints

Apply a low voltage soldering iron (less than 24 V) to the lead(s) of the package, below the seating plane or not more than 2 mm above it. If the temperature of the soldering iron bit is less than 300 °C it may remain in contact for up to 10 seconds. If the bit temperature is between 300 and 400 °C, contact may be up to 5 seconds.

DEFINITIONS

<table>
<thead>
<tr>
<th>Data sheet status</th>
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</thead>
<tbody>
<tr>
<td>Objective specification</td>
</tr>
<tr>
<td>Preliminary specification</td>
</tr>
<tr>
<td>Product specification</td>
</tr>
</tbody>
</table>

Limiting values

Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

Application information

Where application information is given, it is advisory and does not form part of the specification.

LIFE SUPPORT APPLICATIONS

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