Description
The TDA7492P is a dual BTL class-D audio amplifier with single power supply, designed for LCD TVs and monitors.
Thanks to the high efficiency and exposed-pad-down (EPD) package no heatsink is required.

Features
- 25 W + 25 W continuous output power at THD = 10\% with V_{CC} = 20 V and R_L = 8 \Omega
- Wide-range single-supply operation (8 - 26 V)
- High efficiency (\eta = 90\%)
- Four selectable, fixed gain settings of nominally 21.6 dB, 27.6 dB, 31.1 dB and 33.6 dB
- Differential inputs minimize common-mode noise
- Standby and mute features
- Short-circuit protection
- Thermal overload protection
- Externally synchronizable
- ECOPACK®, environmentally-friendly package

Table 1. Device summary

<table>
<thead>
<tr>
<th>Order code</th>
<th>Operating temp. range</th>
<th>Package</th>
<th>Packaging</th>
</tr>
</thead>
<tbody>
<tr>
<td>TDA7492P13TR</td>
<td>-40 to 85 °C</td>
<td>PowerSSO-36 EPD</td>
<td>Tape and reel</td>
</tr>
</tbody>
</table>
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1 Device block diagram

Figure 1 shows the block diagram of one of the two identical channels of the TDA7492P.

Figure 1. Internal block diagram (showing one channel only)
2 Pin description

2.1 Pinout

Figure 2. Pin connections (top view, PCB view)
## 2.2 Pin list

<table>
<thead>
<tr>
<th>Pin n°</th>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SUB_GND</td>
<td>PWR</td>
<td>Connect to the frame</td>
</tr>
<tr>
<td>2,3</td>
<td>OUTPB</td>
<td>O</td>
<td>Positive PWM for right channel</td>
</tr>
<tr>
<td>4,5</td>
<td>PGNDB</td>
<td>PWR</td>
<td>Power stage ground for right channel</td>
</tr>
<tr>
<td>6,7</td>
<td>PVCCB</td>
<td>PWR</td>
<td>Power supply for right channel</td>
</tr>
<tr>
<td>8,9</td>
<td>OUTNB</td>
<td>O</td>
<td>Negative PWM output for right channel</td>
</tr>
<tr>
<td>10,11</td>
<td>OUTNA</td>
<td>O</td>
<td>Negative PWM output for left channel</td>
</tr>
<tr>
<td>12,13</td>
<td>PVCCA</td>
<td>PWR</td>
<td>Power supply for left channel</td>
</tr>
<tr>
<td>14,15</td>
<td>PGNDA</td>
<td>PWR</td>
<td>Power stage ground for left channel</td>
</tr>
<tr>
<td>16,17</td>
<td>OUTPA</td>
<td>O</td>
<td>Positive PWM output for left channel</td>
</tr>
<tr>
<td>18</td>
<td>PGND</td>
<td>PWR</td>
<td>Power stage ground</td>
</tr>
<tr>
<td>19</td>
<td>VDDPW</td>
<td>O</td>
<td>3.3-V (nominal) regulator output referred to ground for power stage</td>
</tr>
<tr>
<td>20</td>
<td>STBY</td>
<td>I</td>
<td>Standby mode control</td>
</tr>
<tr>
<td>21</td>
<td>MUTE</td>
<td>I</td>
<td>Mute mode control</td>
</tr>
<tr>
<td>22</td>
<td>INPA</td>
<td>I</td>
<td>Positive differential input of left channel</td>
</tr>
<tr>
<td>23</td>
<td>INNA</td>
<td>I</td>
<td>Negative differential input of left channel</td>
</tr>
<tr>
<td>24</td>
<td>ROSC</td>
<td>O</td>
<td>Master oscillator frequency-setting pin</td>
</tr>
<tr>
<td>25</td>
<td>SYNCLK</td>
<td>I/O</td>
<td>Clock in/out for external oscillator</td>
</tr>
<tr>
<td>26</td>
<td>VDDS</td>
<td>O</td>
<td>3.3-V (nominal) regulator output referred to ground for signal blocks</td>
</tr>
<tr>
<td>27</td>
<td>SGND</td>
<td>PWR</td>
<td>Signal ground</td>
</tr>
<tr>
<td>28</td>
<td>DIAG</td>
<td>O</td>
<td>Open-drain diagnostic output</td>
</tr>
<tr>
<td>29</td>
<td>SVR</td>
<td>O</td>
<td>Supply voltage rejection</td>
</tr>
<tr>
<td>30</td>
<td>GAIN0</td>
<td>I</td>
<td>Gain setting input 1</td>
</tr>
<tr>
<td>31</td>
<td>GAIN1</td>
<td>I</td>
<td>Gain setting input 2</td>
</tr>
<tr>
<td>32</td>
<td>INPB</td>
<td>I</td>
<td>Positive differential input of right channel</td>
</tr>
<tr>
<td>33</td>
<td>INNB</td>
<td>I</td>
<td>Negative differential input of right channel</td>
</tr>
<tr>
<td>34</td>
<td>VREF</td>
<td>O</td>
<td>Half VDDS (nominal) referred to ground</td>
</tr>
<tr>
<td>35</td>
<td>SVCC</td>
<td>PWR</td>
<td>Signal power supply</td>
</tr>
<tr>
<td>36</td>
<td>VSS</td>
<td>O</td>
<td>3.3-V (nominal) regulator output referred to power supply</td>
</tr>
<tr>
<td></td>
<td>EP</td>
<td>PWR</td>
<td>Exposed pad for connection to ground plane as heatsink</td>
</tr>
</tbody>
</table>
3 Electrical specifications

3.1 Absolute maximum ratings

Table 3. Absolute maximum ratings

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$V_{CCMAX}$</td>
<td>DC supply voltage for pins PVCCA, PVCCB, SVCC</td>
<td>30</td>
<td>V</td>
</tr>
<tr>
<td>$V_i$</td>
<td>Voltage limits for input pins STANDBY, MUTE, INNA, INPA, INNB, INPB, GAIN0, GAIN1</td>
<td>-0.3 to 3.6</td>
<td>V</td>
</tr>
<tr>
<td>$T_{op}$</td>
<td>Operating temperature</td>
<td>-40 to 85</td>
<td>°C</td>
</tr>
<tr>
<td>$T_j$</td>
<td>Junction temperature</td>
<td>-40 to 150</td>
<td>°C</td>
</tr>
<tr>
<td>$T_{stg}$</td>
<td>Storage temperature</td>
<td>-40 to 150</td>
<td>°C</td>
</tr>
</tbody>
</table>

3.2 Thermal data

Table 4. Thermal data

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$R_{th,j-case}$</td>
<td>Thermal resistance, junction to case</td>
<td>2</td>
<td>3</td>
<td>°C/W</td>
<td></td>
</tr>
<tr>
<td>$R_{th,j-amb}$</td>
<td>Thermal resistance, junction to ambient</td>
<td>24 (1)</td>
<td>-</td>
<td>°C/W</td>
<td></td>
</tr>
</tbody>
</table>

1. FR4 with vias to copper area of 9 cm²

3.3 Electrical specifications

Unless otherwise stated, the results in Table 5 below are given for the conditions: $V_{CC} = 20$ V, $R_L$ (load) = 8 Ω, $R_{OSC} = 39$ kΩ, $C8 = 100$ nF, $f = 1$ kHz, $G_V = 21.6$ dB, and $T_{amb} = 25$ °C.

Table 5. Electrical specifications

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Condition</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$V_{CC}$</td>
<td>Supply voltage for pins PVCCA, PVCCB, SVCC</td>
<td>-</td>
<td>8</td>
<td>-</td>
<td>26</td>
<td>V</td>
</tr>
<tr>
<td>$I_q$</td>
<td>Total quiescent</td>
<td>-</td>
<td>26</td>
<td>35</td>
<td>mA</td>
<td></td>
</tr>
<tr>
<td>$I_{qSTBY}$</td>
<td>Quiescent current in standby</td>
<td>-</td>
<td>2.5</td>
<td>5.0</td>
<td>µA</td>
<td></td>
</tr>
<tr>
<td>$V_{OS}$</td>
<td>Output offset voltage</td>
<td>Play mode</td>
<td>-</td>
<td>-</td>
<td>±100</td>
<td>mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mute mode</td>
<td>-</td>
<td>-</td>
<td>±60</td>
<td>mV</td>
</tr>
<tr>
<td>$I_{OCP}$</td>
<td>Overcurrent protection threshold</td>
<td>$R_L = 0$ Ω</td>
<td>3.8</td>
<td>4.2</td>
<td>-</td>
<td>A</td>
</tr>
<tr>
<td>$T_{JSD}$</td>
<td>Junction temperature at thermal shutdown</td>
<td>-</td>
<td>150</td>
<td>-</td>
<td>°C</td>
<td></td>
</tr>
<tr>
<td>$R_i$</td>
<td>Input resistance</td>
<td>Differential input</td>
<td>48</td>
<td>60</td>
<td>-</td>
<td>kΩ</td>
</tr>
</tbody>
</table>
## Electrical specifications

### Table 5. Electrical specifications (continued)

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Condition</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$V_{OVP}$</td>
<td>Overvoltage protection threshold</td>
<td>-</td>
<td>28</td>
<td>29</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td>$V_{UVP}$</td>
<td>Undervoltage protection threshold</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>7</td>
<td>V</td>
</tr>
<tr>
<td>$R_{dSON}$</td>
<td>Power transistor on resistance</td>
<td>High side</td>
<td>-</td>
<td>0.2</td>
<td>-</td>
<td>Ω</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Low side</td>
<td>-</td>
<td>0.2</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>$P_o$</td>
<td>Output power</td>
<td>THD = 10%</td>
<td>-</td>
<td>25</td>
<td>-</td>
<td>W</td>
</tr>
<tr>
<td></td>
<td></td>
<td>THD = 1%</td>
<td>-</td>
<td>20</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>$P_o$</td>
<td>Output power</td>
<td>$V_{CC} = 12$ V, THD = 10%</td>
<td>-</td>
<td>9.5</td>
<td>-</td>
<td>W</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_{CC} = 12$ V, THD = 1%</td>
<td>-</td>
<td>7.2</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>$P_D$</td>
<td>Power dissipated by device</td>
<td>$P_o = 25$ W + 25 W, THD = 10%</td>
<td>-</td>
<td>5.0</td>
<td>-</td>
<td>W</td>
</tr>
<tr>
<td>$\eta$</td>
<td>Efficiency</td>
<td>$P_o = 10$ W + 10 W</td>
<td>80</td>
<td>90</td>
<td>-</td>
<td>%</td>
</tr>
<tr>
<td>THD</td>
<td>Total harmonic distortion</td>
<td>$P_o = 1$ W</td>
<td>-</td>
<td>0.1</td>
<td>0.4</td>
<td>%</td>
</tr>
<tr>
<td>$G_V$</td>
<td>Closed-loop gain</td>
<td>$G_{AIN} = L$, $G_{AIN1} = L$</td>
<td>20.6</td>
<td>21.6</td>
<td>22.6</td>
<td>dB</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$G_{AIN} = L$, $G_{AIN1} = H$</td>
<td>26.6</td>
<td>27.6</td>
<td>28.6</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$G_{AIN} = H$, $G_{AIN1} = L$</td>
<td>30.1</td>
<td>31.1</td>
<td>32.1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$G_{AIN} = H$, $G_{AIN1} = H$</td>
<td>32.6</td>
<td>33.6</td>
<td>34.6</td>
<td></td>
</tr>
<tr>
<td>$\Delta G_V$</td>
<td>Gain matching</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>±1</td>
<td>dB</td>
</tr>
<tr>
<td>CT</td>
<td>Cross talk</td>
<td>$f = 1$ kHz</td>
<td>-</td>
<td>50</td>
<td>-</td>
<td>dB</td>
</tr>
<tr>
<td>$e_N$</td>
<td>Total input noise</td>
<td>$A$ Curve, $G_V = 20$ dB</td>
<td>-</td>
<td>20</td>
<td>-</td>
<td>μV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$f = 22$ Hz to 22 kHz</td>
<td>-</td>
<td>25</td>
<td>35</td>
<td></td>
</tr>
<tr>
<td>SVRR</td>
<td>Supply voltage rejection ratio</td>
<td>$f_r = 100$ Hz, $V_r = 0.5$ V, $C_{SVR} = 10$ μF</td>
<td>40</td>
<td>50</td>
<td>-</td>
<td>dB</td>
</tr>
<tr>
<td>$T_r$, $T_f$</td>
<td>Rise and fall times</td>
<td>-</td>
<td>-</td>
<td>50</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>$f_{SW}$</td>
<td>Switching frequency</td>
<td>Internal oscillator</td>
<td>290</td>
<td>310</td>
<td>330</td>
<td>kHz</td>
</tr>
<tr>
<td>$f_{SWR}$</td>
<td>Output switching frequency range</td>
<td>With internal oscillator $^{(1)}$</td>
<td>250</td>
<td>-</td>
<td>400</td>
<td>kHz</td>
</tr>
<tr>
<td></td>
<td></td>
<td>With external oscillator $^{(2)}$</td>
<td>250</td>
<td>-</td>
<td>400</td>
<td></td>
</tr>
<tr>
<td>$V_{IH}$</td>
<td>Digital input high (H)</td>
<td>-</td>
<td>2.3</td>
<td>-</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td>$V_{IL}$</td>
<td>Digital input low (L)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0.8</td>
<td></td>
</tr>
<tr>
<td>$A_{MUTE}$</td>
<td>Mute attenuation</td>
<td>$V_{MUTE} = 1$ V</td>
<td>60</td>
<td>80</td>
<td>-</td>
<td>dB</td>
</tr>
</tbody>
</table>

1. $f_{SW} = 10^6 / ( (16 \times R_{OSC} + 182) \times 4)$ kHz, $f_{SYNCLK} = 2 \times f_{SW}$ with $R3 = 39$ kΩ, see Figure 20.
2. $f_{SW} = f_{SYNCLK} / 2$ with the frequency of the external oscillator.
4 Characterization curves

The following characterizations were made using the SZ-LAB-TDA7492P demo board. The layout is shown in Figure 19 on page 16. The LC filter for the 6 \Omega load used 22 \mu H and 220 nF components, whilst that for the 8 \Omega load used 33 \mu H and 220 nF.

4.1 Characterizations for 6 \Omega loads with 18 V

**Figure 3. Output power vs. supply voltage**

Test conditions:
- $V_{cc} = 8$ to 18 V,
- $R_L = 6 \Omega$,
- $R_{osc} = 39 \, k\Omega$, $C_{osc} = 100 \, nF$,
- $f = 1 \, kHz$,
- $G_v = 30 \, dB$,
- $T_{amb} = 25^\circ C$

Specification limit:
- Typical:
  - $V_{cc} = 18 \, V$, $R_L = 6 \, \Omega$
  - $P_o = 25 \, W \, @ THD = 10\%$
  - $P_o = 20 \, W \, @ THD = 1\%$

**Figure 4. THD at 1 kHz vs. output power**

Test conditions:
- $V_{cc} = 18 \, V$,
- $R_L = 6 \, \Omega$,
- $R_{osc} = 39 \, k\Omega$, $C_{osc} = 100 \, nF$,
- $f = 1 \, kHz$,
- $G_v = 30 \, dB$,
- $T_{amb} = 25^\circ C$

Specification limit:
- Typical:
  - $P_o = 25 \, W \, @ THD = 10\%$
**Figure 5. THD at 100 Hz vs. output power**

Test conditions:
Vcc = 18 V,
RL = 6 Ω,
Rosc = 39 kΩ, Cosc = 100 nF,
f = 100 Hz,
Gs = 30 dB,
Tamb = 25° C

Specification limit:
Typical:
Pu = 25 W @THD = 10%

**Figure 6. THD at 1 W vs. frequency**

Test conditions:
Vcc = 18 V,
RL = 6 Ω,
Rosc = 39 kΩ, Cosc = 100 nF,
f = 1 kHz,
Gs = 30 dB,
P0 = 1 W
Tamb = 25° C

Specification limit:
Typical:
THD = 0.4%

**Figure 7. Frequency response**

Test conditions:
Vcc = 18 V,
RL = 6 Ω,
Rosc = 39 kΩ, Cosc = 100 nF,
f = 1 kHz,
Gs = 30 dB,
P0 = 1 W
Tamb = 25° C

Specification limit:
Max:
±3 dB @20 Hz to 20 kHz
Figure 8. Crosstalk vs frequency

![Crosstalk vs frequency graph]

Test conditions:
- Vcc = 18 V
- RL = 6 Ω
- Rosc = 39 kΩ, Cosc = 100 nF
- f = 1 kHz
- Gv = 30 dB
- Po = 1 W
- Tamb = 25°C

Specification limit:
- Typical: > 50 dB @ f = 1 kHz

Figure 9. FFT 0 dB

![FFT 0 dB graph]

Test conditions:
- Vcc = 18 V
- RL = 6 Ω
- Rosc = 39 kΩ, Cosc = 100 nF
- f = 1 kHz
- Gv = 30 dB
- Po = 1 W
- Tamb = 25°C

Specification limit:
- Typical: > 60 dB for the harmonic frequency

Figure 10. FFT -60 dB

![FFT -60 dB graph]

Test conditions:
- Vcc = 18 V
- RL = 6 Ω
- Rosc = 39 kΩ, Cosc = 100 nF
- f = 1 kHz
- Gv = 30 dB
- Po = -60 dB @ 1 W = 0 dB
- Tamb = 25°C

Specification limit:
- Typical: > 90dB for the harmonic frequency
4.2 Characterizations for 8 Ω loads with 20 V

Figure 11. Output power vs supply voltage

Test conditions:
- \( Vcc = 8 \text{ to } 20 \text{ V} \)
- \( RL = 8 \Omega \)
- \( Rosc = 39 \text{ k}\Omega \), Cosc = 100 nF
- \( f = 1 \text{ kHz} \)
- \( Gv = 30 \text{ dB} \)
- \( Tamb = 25^\circ \text{ C} \)

Specification limit:
Typical:
- \( Vs = 20 \text{ V}, RL = 8 \Omega \)
- \( Po = 25 \text{ W} \text{ @THD} = 10\% \)
- \( Po = 20 \text{ W} \text{ @THD} = 1\% \)

Figure 12. THD at 1 kHz vs output power

Test conditions:
- \( Vcc = 20 \text{ V} \)
- \( RL = 8 \Omega \)
- \( Rosc = 39 \text{ k}\Omega \), Cosc = 100 nF
- \( f = 1 \text{ kHz} \)
- \( Gv = 30 \text{ dB} \)
- \( Tamb = 25^\circ \text{ C} \)

Specification limit:
Typical:
- \( Po = 25 \text{ W} \text{ @THD} = 10\% \)
Characterization curves

Figure 13. THD at 100 Hz vs output power

Test conditions:
Vcc = 20 V,
RL = 8 Ω,
Rosc = 39 kΩ, Cosc = 100 nF,
f = 100 Hz,
Gv = 30 dB,
Tamb = 25°C

Specification limit:
Typical:
Po = 25 W @THD = 10%

Figure 14. THD at 1 W vs frequency

Test conditions:
Vcc = 20 V,
RL = 8 Ω,
Rosc = 39 kΩ, Cosc = 100 nF,
f = 1 kHz,
Gv = 30 dB,
Po = 1 W
Tamb = 25°C

Specification Limit:
Typical:
THD < 0.4%

Figure 15. Frequency response

Test conditions:
Vcc = 20 V,
RL = 8 Ω,
Rosc = 39 kΩ, Cosc = 100 nF,
f = 1 kHz,
Gv = 30 dB,
Po = 1 W
Tamb = 25°C

Specification limit:
Max:
+/-3 dB @20 Hz to 20 kHz
**Figure 16. Crosstalk vs frequency**

Test conditions:
- $V_{cc} = 20\, V$,
- $R_{L} = 8\, \Omega$,
- $R_{osc} = 39\, k\Omega$, $C_{osc} = 100\, nF$,
- $f = 1\, kHz$,
- $G_{v} = 30\, dB$,
- $P_{o} = 1\, W$
- $T_{amb} = 25^\circ\, C$

Specification limit:
- Typical:
  - $> 50\, dB$ @ $f = 1\, kHz$

**Figure 17. FFT 0 dB**

Test conditions:
- $V_{cc} = 20\, V$,
- $R_{L} = 8\, \Omega$,
- $R_{osc} = 39\, k\Omega$, $C_{osc} = 100\, nF$,
- $f = 1\, kHz$,
- $G_{v} = 30\, dB$,
- $P_{o} = 1\, W$
- $T_{amb} = 25^\circ\, C$

Specification limit:
- Typical:
  - $> 60\, dB$ for the harmonic frequency

**Figure 18. FFT -60 dB**

Test conditions:
- $V_{cc} = 20\, V$,
- $R_{L} = 8\, \Omega$,
- $R_{osc} = 39\, k\Omega$, $C_{osc} = 100\, nF$,
- $f = 1\, kHz$,
- $G_{v} = 30\, dB$,
- $P_{o} = -60\, dB$ (1\, W = 0\, dB)
- $T_{amb} = 25^\circ\, C$

Specification limit:
- Typical:
  - $> 90\, dB$ for the harmonic frequency
Figure 19. Test board (SZ-LAB-TDA7492P) layout
Figure 20. Applications circuit for class-D amplifier

Jumper settings for gain:

<table>
<thead>
<tr>
<th>GAIN0 : GAIN1</th>
<th>Nominal gain</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 V : 0 V</td>
<td>21.6 dB</td>
</tr>
<tr>
<td>0 V : 3.3 V</td>
<td>27.6 dB</td>
</tr>
<tr>
<td>3.3 V : 0 V</td>
<td>31.1 dB</td>
</tr>
<tr>
<td>3.3 V : 3.3 V</td>
<td>33.6 dB</td>
</tr>
</tbody>
</table>

Switch settings for standby, mute and play:

<table>
<thead>
<tr>
<th>STBY : MUTE</th>
<th>Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 V : 0 V</td>
<td>Standby</td>
</tr>
<tr>
<td>0 V : 3.3 V</td>
<td>Standby</td>
</tr>
<tr>
<td>3.3 V : 0 V</td>
<td>Mute</td>
</tr>
<tr>
<td>3.3 V : 3.3 V</td>
<td>Play</td>
</tr>
</tbody>
</table>

LC filter components

- Load: L1, L2, L3, L4, C20, C26
- Values:
  - 4 Ω: 15 μH, 470 nF
  - 8 Ω: 22 μH, 220 nF
  - 16 Ω: 33 μH, 220 nF
  - 32 Ω: 47 μH, 220 nF
6 Applications information

6.1 Mode selection

The three operating modes of the TDA7492P are set by the two inputs STBY (pin 20) and MUTE (pin 21).

- Standby mode: all circuits are turned off, very low current consumption.
- Mute mode: inputs are connected to ground and the positive and negative PWM outputs are at 50% duty cycle.
- Play mode: the amplifiers are active.

The protection functions of the TDA7492P are enabled by pulling down the voltages of the STBY and MUTE inputs shown in Figure 21. The input current of the corresponding pins must be limited to 200 µA.

<table>
<thead>
<tr>
<th>Mode selection</th>
<th>STBY</th>
<th>MUTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standby</td>
<td>L (1)</td>
<td>X (don’t care)</td>
</tr>
<tr>
<td>Mute</td>
<td>H (1)</td>
<td>L</td>
</tr>
<tr>
<td>Play</td>
<td>H</td>
<td>H</td>
</tr>
</tbody>
</table>

1. Drive levels defined in Table 5: Electrical specifications on page 8

Figure 21. Standby and mute circuits

Figure 22. Turn-on/off sequence for minimizing speaker “pop”
6.2 Gain setting

The gain of the TDA7492P is set by the two inputs, GAIN0 (pin 30) and GAIN1 (pin31). Internally, the gain is set by changing the feedback resistors of the amplifier.

<table>
<thead>
<tr>
<th>GAIN0</th>
<th>GAIN1</th>
<th>Nominal gain, $G_v$ (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>21.6</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>27.6</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>31.1</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>33.6</td>
</tr>
</tbody>
</table>

6.3 Input resistance and capacitance

The input impedance is set by an internal resistor $R_i = 60 \, k\Omega$ (typical). An input capacitor ($C_i$) is required to couple the AC input signal.

The equivalent circuit and frequency response of the input components are shown in Figure 23. For $C_i = 470 \, nF$ the high-pass filter cutoff frequency is below 20 Hz:

$$f_c = \frac{1}{2 \pi R_i C_i}$$

![Figure 23. Device input circuit and frequency response](image)
6.4 Internal and external clocks

The clock of the class-D amplifier can be generated internally or can be driven by an external source.

If two or more class-D amplifiers are used in the same system, it is recommended that all devices operate at the same clock frequency. This can be implemented by using one TDA7492P as master clock, while the other devices are in slave mode (that is, externally clocked. The clock interconnect is via pin SYNCLK of each device. As explained below, SYNCLK is an output in master mode and an input in slave mode.

6.4.1 Master mode (internal clock)

Using the internal oscillator, the output switching frequency, $f_{SW}$, is controlled by the resistor, $R_{OSC}$, connected to pin ROSC:

$$f_{SW} = \frac{10^6}{(16 \times R_{OSC} + 182) \times 4} \text{ kHz}$$

where $R_{OSC}$ is in kΩ.

In master mode, pin SYNCLK is used as a clock output pin, whose frequency is:

$$f_{SYNCLK} = 2 \times f_{SW}$$

For master mode to operate correctly then resistor $R_{OSC}$ must be less than 60 kΩ as given below in Table 8.

6.4.2 Slave mode (external clock)

In order to accept an external clock input the pin ROSC must be left open, that is, floating. This forces pin SYNCLK to be internally configured as an input as given in Table 8.

The output switching frequency of the slave devices is:

$$f_{SW} = \frac{f_{SYNCLK}}{2}$$

### Table 8. How to set up SYNCLK

<table>
<thead>
<tr>
<th>Mode</th>
<th>$R_{OSC}$</th>
<th>SYNCLK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Master</td>
<td>$R_{OSC} &lt; 60 \text{ kΩ}$</td>
<td>Output</td>
</tr>
<tr>
<td>Slave</td>
<td>Floating (not connected)</td>
<td>Input</td>
</tr>
</tbody>
</table>

### Figure 24. Master and slave connection

![Master and slave connection diagram]
6.5 Output low-pass filter

To avoid EMI problems, it may be necessary to use a low-pass filter before the speaker. The cutoff frequency should be larger than 22 kHz and much lower than the output switching frequency. It is necessary to choose the L-C component values depending on the loudspeaker impedance. Some typical values, which give a cutoff frequency of 27 kHz, are shown in Figure 25 and Figure 26 below.

**Figure 25. Typical LC filter for a 8 Ω speaker**

![Figure 25. Typical LC filter for a 8 Ω speaker](image)

**Figure 26. Typical LC filter for a 4 Ω speaker**

![Figure 26. Typical LC filter for a 4 Ω speaker](image)
6.6 Protection functions

The TDA7492P is fully protected against overvoltage, undervoltage, overcurrent and thermal overloads as explained here.

**Overvoltage protection (OVP)**

If the supply voltage exceeds the value for $V_{OVP}$ given in Table 5: Electrical specifications on page 8 the overvoltage protection is activated which forces the outputs to the high-impedance state. When the supply voltage drops to below the threshold value the device restarts.

**Undervoltage protection (UVP)**

If the supply voltage drops below the value for $V_{UVP}$ given in Table 5: Electrical specifications on page 8 the undervoltage protection is activated which forces the outputs to the high-impedance state. When the supply voltage recovers the device restarts.

**Overcurrent protection (OCP)**

If the output current exceeds the value for $I_{OCP}$ given in Table 5: Electrical specifications on page 8 the overcurrent protection is activated which forces the outputs to the high-impedance state. Periodically, the device attempts to restart. If the overcurrent condition is still present then the OCP remains active. The restart time, $T_{OCP}$, is determined by the R-C components connected to pin STBY.

**Thermal protection (OTP)**

If the junction temperature, $T_j$, reaches 145 °C (nominally), the device goes to mute mode and the positive and negative PWM outputs are forced to 50% duty cycle. If the junction temperature reaches the value for $T_j$ given in Table 5: Electrical specifications on page 8 the device shuts down and the output is forced to the high-impedance state. When the device cools sufficiently the device restarts.

6.7 Diagnostic output

The output pin DIAG is an open-drain transistor. When the protection is activated it is in the high-impedance state. The pin can be connected to a power supply (<26 V) by a pull-up resistor whose value is limited by the maximum sinking current (200 µA) of the pin.

*Figure 27. Behavior of pin DIAG for various protection conditions*
7 Package mechanical data

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: www.st.com. ECOPACK® is an ST trademark.

The TDA7492P comes in a 36-pin PowerSSO package with exposed pad down. Figure 28 below shows the package outline and Table 9 gives the dimensions.
Figure 28. PowerSSO-36 EPD outline drawing
<table>
<thead>
<tr>
<th>Symbol</th>
<th>Dimensions in mm</th>
<th>Dimensions in inches</th>
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<tbody>
<tr>
<td></td>
<td>Min</td>
<td>Typ</td>
</tr>
<tr>
<td>A</td>
<td>2.15</td>
<td>-</td>
</tr>
<tr>
<td>A2</td>
<td>2.15</td>
<td>-</td>
</tr>
<tr>
<td>a1</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>b</td>
<td>0.18</td>
<td>-</td>
</tr>
<tr>
<td>c</td>
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</tr>
<tr>
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<td>8.5</td>
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<tr>
<td>F</td>
<td>-</td>
<td>2.3</td>
</tr>
<tr>
<td>G</td>
<td>-</td>
<td>-</td>
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<tr>
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<tr>
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<tr>
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<td>-</td>
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</tr>
<tr>
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<td>-</td>
<td>3.65</td>
</tr>
<tr>
<td>U</td>
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<td>1.00</td>
</tr>
<tr>
<td>X</td>
<td>4.10</td>
<td>-</td>
</tr>
<tr>
<td>Y</td>
<td>4.90</td>
<td>-</td>
</tr>
</tbody>
</table>
## 8 Revision history

Table 10. Document revision history

<table>
<thead>
<tr>
<th>Date</th>
<th>Revision</th>
<th>Changes</th>
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<tbody>
<tr>
<td>30-Sep-2008</td>
<td>1</td>
<td>Initial release.</td>
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<tr>
<td>11-May-2009</td>
<td>2</td>
<td>Updated supply operating range to 8 V - 26 V on page 1</td>
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<td></td>
<td>Changed C1 to C8 at beginning of Section 3.3 on page 8</td>
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<td>Updated Table 5: Electrical specifications on page 8 for $V_{CC}$ min, $V_{OS}$ min/max and added new parameter $V_{UV}$</td>
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<td></td>
<td></td>
<td>Updated Figure 20: Applications circuit for class-D amplifier on page 17</td>
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<td></td>
<td>Inserted brackets in equation in Table 5 footnote and in Section 6.4.1 on page 20</td>
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<td></td>
<td>Updated values in UVP and OCP in Section 6.6 on page 22</td>
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<td></td>
<td>Updated voltage to &quot;&lt;26 V&quot; in Section 6.7 on page 22</td>
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<td>Updated max dimensions for A and A2 in Table 9: PowerSSO-36 EPD dimensions on page 25.</td>
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<tr>
<td>02-Sep-2009</td>
<td>3</td>
<td>Updated value for $G_{V}$ at head of Section 3.3 on page 8</td>
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<td>Updated package Y (Min) dimension in Table 9 on page 25.</td>
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<td>19-Jan-2011</td>
<td>4</td>
<td>Updated operating temperature range</td>
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<td>Updated datasheet presentation.</td>
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<tr>
<td>12-Sep-2011</td>
<td>5</td>
<td>Updated OUTNA in Table 2: Pin description list</td>
</tr>
<tr>
<td>20-Feb-2014</td>
<td>6</td>
<td>Updated order code Table 1 on page 1</td>
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