7.3W DUAL AUDIO POWER IC

The KIA6248K is dual audio power amplifier for application.

It contains various kind of protectors and the function of stand-by switch.

FEATURES

- Output Power
  \( \text{P}_{\text{OUT}} \geq 7.3\text{W (Typ.)} \)
  \( (V_{\text{CC}}=13.2\text{V}, R_L=2\Omega, f=1\text{kHz}, \text{THD}=10\%) \)
  \( \text{P}_{\text{OUT}} \geq 6.4\text{W (Typ.)} \)
  \( (V_{\text{CC}}=14.4\text{V}, R_L=4\Omega, f=1\text{kHz}, \text{THD}=10\%) \)
  \( \text{P}_{\text{OUT}} \geq 5.3\text{W (Typ.)} \)
  \( (V_{\text{CC}}=13.2\text{V}, R_L=4\Omega, f=1\text{kHz}, \text{THD}=10\%) \)

- Total Harmonic Distortion
  \( \text{THD}=0.1\% \text{(Typ.)} \)
  \( (V_{\text{CC}}=13.2\text{V}, R_L=4\Omega, f=1\text{kHz}, \text{P}_{\text{OUT}}=1\text{W}) \)

- Built-in Stand-by Switch Function
  \( \text{ISTBY}=1\mu\text{A (Typ.)} \)
  (With \( \Phi \) pin set at High, power is turned ON.)

- Built-in Various Protection Circuits
  : OVER Voltage, Thermal Shut Down
  : Out to GND, out to \( V_{\text{CC}} \) Short

- Built-in Junction Temperature Detection Function
  (Pin \( \Phi \) : 10mW/\(^\circ\)C)

- Operation supply voltage range : \( V_{\text{CC}}=6 \sim 18\text{V} \).
### MAXIMUM RATINGS (Ta=25°C)

<table>
<thead>
<tr>
<th>CHARACTERISTIC</th>
<th>SYMBOL</th>
<th>RATING</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak Supply Voltage</td>
<td>$V_{CC}$ surge</td>
<td>50</td>
<td>V</td>
</tr>
<tr>
<td>DC Supply Voltage</td>
<td>$V_{CC}$ DC</td>
<td>20</td>
<td>V</td>
</tr>
<tr>
<td>Operating Supply Voltage</td>
<td>$V_{CC}$ opr</td>
<td>18</td>
<td>V</td>
</tr>
<tr>
<td>Output Current (Peak)</td>
<td>$I_{D(peak)}$</td>
<td>4.5</td>
<td>A</td>
</tr>
<tr>
<td>Power Dissipation</td>
<td>$P_D$</td>
<td>15</td>
<td>W</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>$T_{opr}$</td>
<td>-30~85</td>
<td>°C</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>$T_{stg}$</td>
<td>-55~150</td>
<td>°C</td>
</tr>
</tbody>
</table>

### ELECTRICAL CHARACTERISTICS

(Unless otherwise specified, $V_{CC}=13.2V$, $f=1kHz$, $R_g=600\Omega$, $R_L=4\Omega$, $Ta=25°C$)

<table>
<thead>
<tr>
<th>CHARACTERISTIC</th>
<th>SYMBOL</th>
<th>TEST CONDITION</th>
<th>MIN.</th>
<th>TYP.</th>
<th>MAX.</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quiescent Current</td>
<td>$I_{CCQ}$</td>
<td>$V_{IN}=0$</td>
<td>-</td>
<td>60</td>
<td>150</td>
<td>mA</td>
</tr>
<tr>
<td>Output Power</td>
<td>$P_{OUT}$ (1)</td>
<td>$R_L=2\Omega$, THD=10%</td>
<td>-</td>
<td>7.3</td>
<td>-</td>
<td>W</td>
</tr>
<tr>
<td></td>
<td>$P_{OUT}$ (2)</td>
<td>$V_{CC}=14.4V$, THD=10%</td>
<td>-</td>
<td>6.4</td>
<td>-</td>
<td>W</td>
</tr>
<tr>
<td></td>
<td>$P_{OUT}$ (3)</td>
<td>THD=10%</td>
<td>4.8</td>
<td>5.3</td>
<td>-</td>
<td>W</td>
</tr>
<tr>
<td>Total Harmonic Distortion</td>
<td>THD</td>
<td>$P_{OUT}=1W$</td>
<td>-</td>
<td>0.1</td>
<td>0.5</td>
<td>%</td>
</tr>
<tr>
<td>Voltage Gain</td>
<td>$G_V$</td>
<td>$V_{OUT}=0dBm$</td>
<td>50</td>
<td>52</td>
<td>54</td>
<td>dB</td>
</tr>
<tr>
<td>Voltage Gain Ratio</td>
<td>$\Delta G_V$</td>
<td>$V_{OUT}=0dBm$</td>
<td>-1</td>
<td>0</td>
<td>1</td>
<td>dB</td>
</tr>
<tr>
<td>Output Noise voltage</td>
<td>$V_{NO}$</td>
<td>$R_g=0\Omega$, $BW=20Hz \sim 20kHz$</td>
<td>-</td>
<td>0.20</td>
<td>0.7</td>
<td>mVrms</td>
</tr>
<tr>
<td>Ripple Rejection Ratio</td>
<td>$R_R$</td>
<td>$R_g=600\Omega$, $V_{INP}=0dBm$, $f_{INP}=100Hz$</td>
<td>40</td>
<td>57</td>
<td>-</td>
<td>dB</td>
</tr>
<tr>
<td>Cross Talk</td>
<td>$C.T$</td>
<td>$R_g=600\Omega$, $V_{OUT}=0dBm$</td>
<td>-</td>
<td>65</td>
<td>-</td>
<td>dB</td>
</tr>
<tr>
<td>Input Resistance</td>
<td>$R_{IN}$</td>
<td>-</td>
<td>-</td>
<td>30</td>
<td>-</td>
<td>kΩ</td>
</tr>
<tr>
<td>Stand-By Current</td>
<td>$I_{STBY}$</td>
<td>Pin $\oplus$ : GND</td>
<td>-</td>
<td>1</td>
<td>10</td>
<td>(\mu)A</td>
</tr>
</tbody>
</table>
BLOCK DIAGRAM / TEST CIRCUIT
APPLICATION CIRCUIT (BTL MODE)
CAUTION AND APPLICATION METHOD
(Description is made only on the single channel.)

1. Voltage Gain Adjustment
   The closed loop voltage gain ($G_v$) is determined by $R_1$, $R_2$, and $R_f$.
   
   $$G_v=20\log\frac{R_1+R_2}{R_1+R_f} \text{ (dB)}$$
   
   When $R_f=0$, $G_v=52\text{dB}(\text{Typ})$ is given.
   
   The voltage gain is reduced when $R_f$ is increased.
   
   (Fig.2)
   
   With the voltage gain reduced, since the oscillation stability is reduced, refer to the items 3.

2. Stand-by SW Function
   By means of controlling pin⑨ (Stand-by terminal) to high and low, the power supply can be set to ON and OFF. The threshold voltage of pin⑨ is set at 2.1V(3Vdd), and the power supply current is about 1μA(Typ.) at the stand-by state.

   Control Voltage pin⑨ : $V(SB)$

<table>
<thead>
<tr>
<th>Stand-by</th>
<th>Power</th>
<th>$V_{SB}$ (V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
<td>OFF</td>
<td>0~2</td>
</tr>
<tr>
<td>OFF</td>
<td>ON</td>
<td>3~$V_{CC}$</td>
</tr>
</tbody>
</table>

   Advantage of Stand-by SW
   (1) Since $V_{CC}$ can directly be controlled to ON, OFF by the microcomputer, the switching relay can be omitted.
   (2) Since the control current is microscopic, the switching relay of small current capacity is satisfactory for switching.

   ![Diagram of Large current capacity switch and Small current capacity switch](image)

   - Conventional Method -

   ![Diagram of Relay directly from microcomputer](image)

   - Stand-by Switch Method -
3. Preventive Measure Against Oscillation

$C_{osc}$: For preventing the oscillation, it is advisable to use $C_{osc}$, the condenser of polyester film having small characteristic fluctuation of the temperature and the frequency.

The resistance $R$ to be series applied to $C_{osc}$ is effective for phase correction of high frequency, and improves the oscillation allowance.

(1) Voltage gain to be used ($V_{in}$ Setting)
(2) Capacity value of condenser
(3) Kind of condenser
(4) Layout of printed board

In case of its use with the voltage gain $V_{in}$ reduced or with the feedback amount increased, care must be taken because the phase-inversion is caused by the high frequency resulting in making the oscillation liable generated.

4. Junction Temperature Detecting pin ①

Using temperature characteristic of a band gap circuit and in proportion to junction temperature, pin① DC voltage : $V_2$ rises at about $+10\text{mV/°C}$ temperature characteristic. So, the relation between $V_2$ at $T_j=25\text{°C}$ and $V_{2x}$ at $T_j=x\text{°C}$ is decided by the following expression:

$$T(x\text{°C}) = \frac{V_2 - V_{2(25\text{°C})}}{10\text{mV/°C}} + 25(\text{°C})$$

In deciding a heat sink size, a junction temperature can be easily made clear by measuring voltage at this pin while a backside temperature of IC was so far measured using a thermocouple type thermometer.

5. Pop Noise

The pop noise is reduced by the time constant $\tau$ of pin⑧ : smoothing.
Therefore, we recommend $C_S=100\mu\text{F}$, which is between pin⑧ and GND, because the pop noise will become worse by using the smaller capacity of $C_S$. 

$C_S=100\mu\text{F}$ : RECOMMENDED VALUE

$C_S=10\mu\text{F}$ : LESS THAN RECOMMENDED VALUE