Universal Earphones
: Earphones with Automatic Side and Shared Use Detection

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1. Universal Earphones

The universal earphones (UE) that uses both a proximity sensor and a skin conductance sensor has two main features:

• Detect the sides of the ears and provides audio to the suitable side of the ear
• Detect shared use of the earphones and provides mixed stereo sound to both sides of earphones.

These features not merely free the users from checking the sides of the earphones, but enable the user to enjoy audio sharing with other people.

2. Innovative technology

Proximity Sensor

• In order to detect the sides of the ears, a proximity sensor is embed in a single side of the UE, and measure the distance between the center of the earphone and the pinna (external ear).

<table>
<thead>
<tr>
<th>Distance</th>
<th>Universal Earphone</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 30 mm</td>
<td>activates the right</td>
</tr>
<tr>
<td>&gt; 30 mm</td>
<td>activates the left</td>
</tr>
</tbody>
</table>

• To determine the distance threshold, the Anthropometrical Database is referred.

Skin Conductance Sensor

• A skin conductance sensor is embed in a single side of the UE and apply it to the weak current from the other side of the earphones to determine if the earphones are shared by two persons or not. In contrast to the case in which the UE is used by single person, there is no live electricity with shared use because the persons have no electrical connections.

• When two persons share UE, it mixes stereo audio channels: that is, the users are able to hear not only a single channel of music, but also mixed-stereo channels through only a single ear. This feature makes it possible to improve the audio experience when a user is sharing the earphones with a friend.


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